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REPORT

OF

THE FIFTH COSPAR MEETING

Washington, D.C., U.S.A.

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April 30 - May 9

1962

Notes on organization of the Report

Having regard to the stipulations of the COSPAR Charter (section 6, paragraph 7), the organization of this report necessitates the following explanations.

1. The agenda for the Executive Council, which makes recommendations to the full COSPAR on certain points set forth in the Charter, was largely parallel to the agenda for the full COSPAR. As most readers would be annoyed at having to look up recommendations and decisions in two separate documents, the report of the Executive Council meeting in Washington has been combined with the report of the full COSPAR meeting and will not be issued separately. This has been achieved by adding any relevant information from the meeting of the Executive Council to the report on the corresponding subject discussed in the full COSPAR.

2. Texts of the resolutions are given under the subject heading to which they refer. Unless stated otherwise they have been unanimously adopted by the full COSPAR. An index of all these resolutions is given on pages 1 and 2 of this report.

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INTRODUCTION

1. COSPAR Business meetings

The Fifth meeting of the Committee on Space Research (COSPAR) took place at the National Academy of Sciences, Washington, D.C., U.S.A., on 30 April, 1, 4 and 9 May, 1962. A complete list of delegates, advisors and observers who were present at one or more of the sessions is given on pages 8-9 of this report.

Plenary sessions were held on 1 May from 10.00 to 12.30 and 14.30 to 17.00; and on 9 May from 9.00 to 12.00 and 14.00 to 15.30.

The Executive Council met on 30 April from 9.00 to 12.00 and 20.00 to 22.00; on 4 May from 14.30 to 17.30; and on 7 May from 10.00 to 12.00 .

The Bureau met on 29 April from 20.00 to 22.00 .

The Working Groups and their sub-groups met at various times during the period 30 April to 9 May.

2. Third International Space Science Symposium

The Third International Space Science Symposium was held concurrently with the Fifth Plenary Meeting of COSPAR. The Symposium sessions took place all day on 2, 3, 7 and 8 May 1962. More than 500 scientists from 26 countries were registered. About 140 papers by scientists from 14 countries were presented in one of the following sessions:

Session I - Upper Atmosphere and Exosphere of the Earth and Relationship to Solar Disturbances

Session II - The Sun and the Interplanetary Medium

Session III - The Moon and the Planets

Session IV - Galactic and Extra-galactic Astronomy

Session V - Life Sciences

Session VI - Technologies of Space Research

Session VII - Open meeting of Working Group 1 on Tracking and Telemetry

Among the delegates to the Symposium were Major Gherman S. Titov and Lt. Colonel John H. Glenn Jr. who testified to

the scientific results of their space flights. Prof. van de Hulst paid tribute to the brilliant achievements of these two astronauts and to the thousands of scientific workers who have made these manned orbital flights possible.

The proceedings of the Third International Space Science Symposium (Space Research III) will be published by North-Holland Publishing Company and edited by Dr. W. Priester.

3. Opening Ceremony

The Fifth Plenary Meeting of COSPAR and the Third International Space Science Symposium were officially opened on 1 May at 10.00 . Dr. Detlev W. Bronk, President, U.S. National Academy of Sciences, welcomed the participants to the meetings and wished them productive sessions. Dr. J.B. Wiesner, Science Advisor to the President of the United States, read a message on behalf of President John F. Kennedy, in which he recalled the progress made during the last year in space exploration and the advances in cooperation among nations. Mr. James E. Webb, Administrator, U.S. National Aeronautics and Space Administration (NASA), referred to the major international programs of NASA and pointed out that today the first international satellite containing British experiments launched by an American vehicle was in orbit.

In his opening address, Prof. van de Hulst, President of COSPAR, thanked the preceding speakers for their welcoming remarks. He spoke of the tremendous progress in space science and technology which took place during the last years, the most conspicuous part of which were the first flights of man in space.

He mentioned also the innumerable other achievements, many of which were obtained from instrumented satellites launched in the USA or the USSR, but many of which are based on smaller or larger rocket soundings in a good many other countries. He referred to the two very successful Symposia which COSPAR had already had jointly with other international bodies in Washington during the last week: "The International Symposium on Rocket and Satellite Meteorology" organized jointly with WMO and IUGG, and the "International Symposium on the Use of Artificial Satellites for Geodesy" organized jointly with the International Association of Geodesy (IAG) and the American Geophysical Union.

The President remarked that COSPAR is grateful that the General Assembly of the United Nations Organization has passed a number of resolutions constructive towards the peaceful uses of outer space and that the Committee on the Peaceful Uses of Outer Space created by the United Nations had now started its work. He welcomed the observers from this committee and from the specialized agencies of the United Nations and reiterated the resolutions by which COSPAR offered in the preceding years

its services to the United Nations and expressed the hope that the world's scientists contribute their share to world peace and international cooperation.

Finally he referred to the difficult problem of inter-field communication. In COSPAR this problem is very real because COSPAR cuts across the traditional disciplines. COSPAR can continue to fulfill an important function in this respect and it is obvious to all of us that a new result obtained by a satellite experiment gains its full value only when fully co-ordinated and compared with results obtained by more conventional methods. He stressed the importance for COSPAR to have very close relationship with the international scientific unions.

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PART I GENERAL BUSINESS

4. Membership and Representation

Prof. van de Hulst reviewed the present membership of COSPAR which now comprises 18 national scientific institutions and 10 international scientific unions as follows:

a) National scientific institutions

Argentina	Consejo Nacional de Investigaciones Científicas y Técnicas, Buenos Aires
Australia	Academy of Science, Canberra
Belgium	Académie Royale de Belgique, Brussels Koninklijke Vlaamse Academie van België, Brussels
Canada	National Research Council, Ottawa
Czechoslovakia	Ceskoslovenská Akademie Ved, Prague
France	Académie des Sciences, Paris
German Federal Republic	Deutsche Forschungsgemeinschaft, Bad Godesberg
India	Ministry of Scientific Research and Cultural Affairs, New Delhi
Italy	Consiglio Nazionale delle Ricerche, Rome
Japan	The Science Council of Japan, Tokyo
Netherlands	Koninklijke Nederlandse Akademie van Wetenschappen, Amsterdam
Norway	Det Norske Videnskaps-Akademi, Oslo
Poland	Polskiej Akademii Nauk, Warsaw
South Africa	South African Council for Scientific and Industrial Research, Pretoria
Switzerland	Société Helvétique des Sciences Naturelles, Zurich
U.K.	The Royal Society, London
U.S.A.	National Academy of Sciences of the U.S.A., Washington, D.C.
U.S.S.R.	Academy of Sciences of the U.S.S.R., Moscow

b) International scientific unions

IAU	International Astronomical Union
IUB	International Union of Biochemistry
IUBS	International Union of Biological Sciences

IUPAC	International Union of Pure and Applied Chemistry
IUGG	International Union of Geodesy and Geophysics
IMU	International Mathematical Union
IUTAM	International Union of Theoretical and Applied Mechanics
IUPAP	International Union of Pure and Applied Physics
IUPS	International Union of Physiological Sciences
URSI	International Scientific Radio Union

The President reported that no further applications for membership had been received.

The following observers were admitted to the meeting and welcomed by the President:

a) Non-member countries

Austria	-	Dr. O. Burkard
Denmark	-	Dr. A. Lundbak
Pakistan	-	Dr. M. Rahmatullah
Spain	-	Dr. J. Valdés
Sweden	-	Dr. J. Ortner

b) ICSU Committees

CIG	-	Prof. W.J.G. Beynon
SCAR	-	Dr. H. Wexler
IWDS	-	Dr. A.H. Shapley

c) United Nations and its specialized agencies

Czech Delegate to UN Committee on the Peaceful Uses of Outer Space	-	Mr. A. Nenko
UNESCO	-	Dr. E.M. Fournier d'Albe
WMO	-	Dr. H. Wexler

Observers from ITU and CCIR were unable to attend the COSPAR meetings because of meetings of these bodies which were being held at the same time.

d) Other organizations

IAF	-	Dr. M. Summerfield Dr. J.J. Harford and Mr. R.D. Swezey
IAA	-	Prof. A. Ehmert

The observer appointed by the European Preparatory Commission for Space Research (COPERS) was unable to attend.

COMPLETE LIST OF PARTICIPANTS

Bartels, J.	Delegate for German Federal Republic, Chairman of Working Group 2
Beynon, W.J.G.	Pro tem delegate for URSI, observer for CIG
Blagonravov, A.A.	Delegate for USSR, Vice-pres. of COSPAR
Blamont, J.	Pro tem delegate for IUPAP
Boggs, K.D.	Advisor to delegate for U.S.A.
Buchar, E.	Delegate for Czechoslovakia
Burkard, O.	Observer for Austria
Burton, M.	Pro tem delegate for IUPAC
Calvin, M.	Pro tem delegate for IUB
Carver, J.H.	Advisor to delegate for Australia
Chapman, J.H.	Advisor to delegate for Canada
Dryden, H.L.	Advisor to delegate for U.S.A.
Ehmert, A.	Observer for IAA, advisor to delegate for German Federal Republic
Fournier d'Albe, E.M.	Observer for UNESCO
Frutkin, A.	Advisor to delegate for U.S.A.
Ghielmetti, H.S.	Advisor to delegate for Argentina
Golay, M.	Delegate for Switzerland
Harford, J.J.	Observer for IAF
Hatanaka, T.	Pro tem delegate for Japan
Hirao, K.	Advisor to delegate for Japan
van de Hulst, H.C.	IAU delegate, President of COSPAR
Kallmann-Bijl, Mrs H.K.	Chairman of Working Group 4
Kaplan, J.	Delegate for IUGG
Landmark, B.	Pro tem delegate for Norway
Lundbak, A.	Observer for Denmark
MacLennan, A.S.	Member of ICSU Secretariat
Maeda, K.	Advisor to delegate for Japan
Martyn, D.F.	Delegate for Australia, Member of COSPAR Finance Committee
Massevitch, Mrs A.G.	Chairman of Working Group 1
Massey, H.S.W.	Delegate for U.K.
Masson, D.R.U.	Pro tem delegate for South Africa
van Mieghem, J.	Secretary General of ICSU

Mitra, A.P.	Chairman of Working Group 3
Moore, A.F.	Advisor to delegate for U.K.
Muller, P.	Advisor to delegate for France
Nenko, A.	Czech delegate on UN Committee on the Peaceful Uses of Outer Space
Newell, H.E.	Advisor to delegate for U.S.A.
Nicolet, M.	Delegate for Belgium, Alternate delegate for IUGG
Occhialini, G.	Pro tem delegate for Italy
Odishaw, H.	Advisor to delegate for U.S.A.
Orlen, J.	Advisor to delegate for U.S.A.
Ortner, J.	Observer for Sweden
Pecker, J.C.	Advisor to delegate for France
Pfotzer, G.	Advisor to delegate for German Fed. Rep.
Porter, R.W.	Delegate for U.S.A., Vice-pres. of COSPAR
Pressey, B.G.	Advisor to delegate for U.K.
Rahmatullah, M.	Observer for Pakistan
Ramanathan, K.R.	Advisor to delegate for India
Robins, M.O.	Alternate delegate for U.K.
Roederer, J.G.	Delegate for Argentina
Rösch, J.	Advisor to delegate for France
Rose, D.C.	Delegate for Canada, member of COSPAR Finance Committee
Rosser, J.B.	Delegate for IMU
Roy, M.	Delegate for IUTAM
Sarabhai, V.A.	Delegate for India
Sehnal, L.	Advisor to delegate for Czechoslovakia
Shapley, A.H.	Observer for IWDS
Summerfield, M.	Observer for IAF
Swezey, R.D.	Observer for IAF
Tardi, P.	Delegate for France
Twiss, P.M.	Advisor to delegate for Australia
Valdés, J.	Observer for Spain
Veldkamp, J.	Delegate for the Netherlands
Wexler, H.	Observer for WMO, observer for SCAR
Zonn, W.	Delegate for Poland

Beaulieu, P.J. (Executive Secretary of COSPAR)

5. Report of the President

Prof. van de Hulst summarized the principal factors describing the situation since COSPAR's last meeting as follows:

a) Recognition of COSPAR's task by references to COSPAR in resolutions of the United Nations Organization and by subsequent action of the UN Committee on the Peaceful Uses of Outer Space. COSPAR is now recognized as the obvious non-governmental body to discuss space matters on an international level.

b) Achievements in manned space flights in the USSR and the USA. Although these flights have not been our prime focus of interest in COSPAR, progress made in this area will certainly be of great importance to science.

c) General support for major cooperative undertaking of the IQSY (International Quiet Sun Year). The IQSY will focus the interest of Unions in years to come and it is obvious that many experiments will be made with rockets and satellites.

d) Important progress in scientific results regarding the earth's atmosphere and processes in interplanetary space.

e) No conspicuous progress in deep-space missions, exobiology, and the contamination problem. This however does not mean no progress; much preparation is going on and before long there may be need for a Working Group in this area.

In his remarks to the Executive Council, the President recalled the main task of this body which is to give guidance to the scientific policy of COSPAR. He explained that COSPAR was a non-governmental body and was part of the ICSU family which contains the International Scientific Unions on one hand, the National scientific institutions on the other hand, and a number of scientific committees in between. COSPAR is responsible to ICSU in all matters.

The earlier danger that these non-governmental bodies would be of very limited use because they would be considered as non-entities by the large intergovernmental bodies, such as the U.N., UNESCO, WMO, ITU, appears to be overcome now. The specific mention of ICSU and its space research committee, COSPAR, in Resolution 1721 (XVI) (see Appendix B, page 93), adopted by the UN General Assembly in December 1961 was, he thought, without precedent, and COSPAR must certainly answer to the new responsibilities and opportunities put before it.

6. National Reports

On Tuesday, May 1, national reports were presented by the following countries:

Argentina	Japan
Australia	Netherlands
Belgium	Norway
Canada	Poland
Czechoslovakia	South Africa
France	Switzerland
German Federal Republic	United Kingdom
Greece	U.S.A.
India	U.S.S.R.
Italy	

These national reports will be published in a special issue of the COSPAR Information Bulletin.

7. Election of new President

Prof. van de Hulst recalled that on several occasions he had expressed his desire to retire from the presidency. Referring to the rule that every officer has a term of three years, he remarked that when he accepted the nomination at the Nice meeting of COSPAR in January 1960, he asked permission to consider his term of office to have started in November 1958. He thanked all the members of COSPAR for their cooperation and mentioned that he had very much enjoyed his work as president. He asked the Executive Council to accept his resignation. The Executive Council deeply regretted Prof. van de Hulst's decision and accepted his resignation with great reluctance.

The Executive Council then nominated unanimously Professor Maurice Roy, representing the International Union of Theoretical and Applied Mechanics, as President for the year 1962-63. The Plenary meeting of COSPAR unanimously approved this nomination. In order not to confuse the scheduling of elections, the term of Prof. Roy's appointment was made for one year, and next year there will be new elections for the entire Bureau.

Following his election as new President, Prof. Roy expressed the wish that Prof. van de Hulst would remain a member of the COSPAR Bureau. He then added: "C'est un grand honneur pour l' Union que je représente ainsi que pour moi-même d'accepter le poste que vous me confiez. Avec l'aide des Vice-présidents et du Secrétariat, je m'efforcerai de poursuivre avec précision la

trajectoire que le Président nous a tracée. Je m'appliquerai à suivre la sagesse et l'intelligence dont M. van de Hulst a fait preuve durant la période de sa présidence."

Dr. Porter then nominated Professor van de Hulst to replace Prof. Roy as a member of the Bureau. This nomination was unanimously approved by the full COSPAR.

8. Finance

The COSPAR Finance Committee met on Monday 7th May. Present were: Dr. D.C. Rose who acted as chairman, Dr. D.F. Martyn, and Mr. A.S. MacLennan (representing the Treasurer of ICSU).

a) Accounts for the year 1961

The account of income and expenditure for the year ended 31 December 1961 has been audited by the ICSU auditor and is given on pages 14-15.

The Committee noted that the balance at 1 January 1961 of $12,500.00 had increased to $29,600.00 at 31 December 1961. This was mainly due to the following factors:

i) Larger income as a result of contributions received from more National members;
ii) Receipt of special grants for the Florence meeting;
iii) No Working Group expenditure was incurred in 1961;
iv) The administrative expenses were lower than expected owing to the fact that the Executive Secretary was not appointed until 1 October 1961.

The Committee felt that these accounts were extremely satisfactory and recommended that they be accepted by COSPAR.

b) Budget estimate for 1962

The Committee carefully considered the requirements for 1962 and recommended to COSPAR the "Budget Estimate for 1962" which is given on pages 16-17.

The recommendation of the COSPAR Working Group on Data and Publications, to introduce a subscription for the COSPAR Information Bulletin has been taken into account in estimating a possible income of $1,000.00 from this source.

The low cost of the present meeting in Washington derives mainly from two sources:

i) Income from registration fees;
ii) The fact that all administrative expenses have been borne by the National Academy of Sciences of the USA.

The Committee felt that all other income and expenditure has been carefully estimated and that the balance at 31 December 1962 will amount to $20,900.00.

c) Budget estimate for 1963

A budget estimate for 1963 was rather more difficult to frame, but the Finance Committee hoped that the statement (see page 18) would be accepted by COSPAR as being a reasonable estimate.

At the Florence meeting of COSPAR the question was raised of a possible increase in the national contributions to COSPAR to take effect as from 1963. The Committee considered this question, but felt that the present financial structure is adequate - at least as far as 1963 is concerned.

The Committee recommended, therefore, that no increase in national contributions be envisaged for 1963, and that this question be reexamined next year with reference to 1964.

The Committee pointed out that the anticipated balance at 31 December 1963 is approximately at the same level as that at 1 January 1961 and that this appeared satisfactory.

d) Action of the Plenum

The COSPAR Plenum reviewed the report of the Finance Committee and accepted it. COSPAR acknowledged with gratitude the very generous assistance of the National Academy of Sciences of the USA in providing the administrative expenses for the COSPAR meetings and Symposium. In the discussion which followed, the question was raised of increasing the amount shown in the 1963 Budget estimate for "travel assistance to scientists attending the COSPAR Symposium". Dr. Rose remarked that this budget was quite flexible and that probably the funds required for travel assistance would be less next year since the next COSPAR Symposium will be held in Europe. The delegate for India suggested that the procedure for allocating travel funds to participants in the Symposium should start several months before the date of the Symposium and he felt that COSPAR should adopt, as a general rule, the offer of one half of the travel costs.

The President thanked the members of the Finance Committee for their careful and thorough report.

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Income and Expenditure Account
For the Year ended 31 December 1961

INCOME		$
Balance as at 1 January 1961		12,507.59
Contributions from National Members:		
Australia	2,500.00	
Belgium (2 Years - 1960 & 1961)	2,000.00	
Canada	3,000.00	
Czechoslovakia	1,000.00	
France	2,500.00	
German Federal Republic	1,000.00	
Italy	1,000.00	
Japan	2,500.00	
The Netherlands	1,000.00	
Poland	1,000.00	
South Africa	1,000.00	
Switzerland	1,000.00	
U.S.S.R.	5,000.00	
U.K.	2,500.00	
U.S.A.	5,000.00	
	32,000.00	
Additional Voluntary Contributions from National Members:		
France	2,500.00	
U.S.A.	5,000.00	39,500.00
Special Grants for COSPAR Meeting in Florence:		
Contract from UNESCO	4,800.00	
Grant from the National Academy of Sciences of the U.S.A.	8,000.00	
Grant from the Rockefeller Foundation	5,000.00	17,800.00
Royalties received in respect of Sales in 1961 of Volume on Nice Symposium		1,255.52
Profit on Exchange less Bank Charges (net)		97.77
		$ 71,160.88

Income and Expenditure Account
For the Year ended 31 December 1961

EXPENDITURE		$
Meetings		
COSPAR Meeting in Florence		17,029.79
Printing and Publication		
Expenses of printing and distribution of Information Bulletins and Circulars		1,811.57
Contribution to I.U.C.A.F.		2,500.00
Administration Expenses		
Salaries etc.	8,538.46	
Honorarium to President	5,000.00	
Office Furniture	47.86	
Rent of Office	1,091.88	
Cleaning Heating and Lighting of Office	784.27	
Stationery and Supplies	333.17	
Purchase of Books and Reprints	387.27	
Translations	164.56	
Postages	917.10	
Telephone and Telegrams	365.84	
Sundry Office Expenses	310.57	
	17,940.98	
Travelling Expenses	901.04	
		18,842.02
Dues to ICSU $3\frac{1}{2}\%$ of $39,500.00		1,382.50
		41,565.88
Balance as at 31 December 1961		29,595.00
		$ 71,160.88

BUDGET ESTIMATE FOR 1962

INCOME		$
Balance in hand at 1 January 1962		29,595
Contributions		
Regular contributions from national members	34,000.00	
Voluntary increases	6,000.00	40,000
Royalties		
Space Research Volumes and CIRA 1961		2,000
		$ 71,595

BUDGET ESTIMATE FOR 1962

EXPENDITURE				$
Meetings:				
Plenary Meeting & Symposium, Washington, D.C.				
Travel of Bureau and Secretariat		8,000		
Travel assistance to scientists		14,000		
		22,000		
Less: Income from registration fees	5,000			
Contract from UNESCO	5,000	10,000	12,000	
Bureau Meeting end of 1962			2,000	14,000
Representation of COSPAR at other meetings				2,000
Contribution to I.U.C.A.F.				2,500
Expenses of Working Groups				7,000
Salaries				
Executive Secretary		9,000		
Secretarial salaries		4,000		13,000
Administrative Expenses				
Rent of Office		1,100		
Furniture and equipment		1,000		
Cleaning, heating, lighting & maintenance		1,000	3,100	
Stationery and supplies		750		
Postages		1,250		
Telephone, telegrams		700		
Sundry Office Expenses		500	3,200	
Travelling expenses President, Secretariat, etc.			1,500	7,800
Printing and Publications				
COSPAR Information Bulletin		1,500		
Special Issues and reports		2,500		
		4,000		
Less: Income from subscriptions		1,000		3,000
Dues to ICSU				
3½% of $40,000				1,400
Balance in hand at 31 December 1962				20,895
			$	71,595

BUDGET ESTIMATE FOR 1963

INCOME		$
Balance in hand at 1 January 1963		20,895
Regular National Contributions		35,000
Additional National Contributions, special grants, etc.		15,000
Royalties		2,500
		$ 73,395

EXPENDITURE		
Meetings		
One full COSPAR meeting and symposium including meetings of the Executive Council and Bureau	8,000	
Travel assistance to scientists attending symposium	12,000	20,000
Expenses of Working Groups		8,000
Secretariat		
Salaries	15,000	
Administrative Expenses	9,000	24,000
Printing and Publications		
COSPAR Information Bulletin and Special Issues	5,000	
Less: Income from subscriptions	1,250	3,750
Dues to ICSU		1,400
Other miscellaneous costs (including contribution to IUCAF)		5,000
Balance in hand at 31 December 1963		11,245
		$ 73,395

9. ICSU Resolution 10 (1961) - "Space Experiments with Potentially Undesirable Effects"

The Executive Council discussed at length the Resolution adopted by ICSU on "Space Experiments with potentially undesirable effects". The text of this resolution is given in Appendix A, page 91 of this Report. The President recalled that this question had already been discussed by ICSU before COSPAR was established. He referred to the Inter-Union Committee on Contamination by extra-terrestrial exploration (CETEX), disbanded in 1959. COSPAR had received the mandate to follow up the work of this committee but owing to the fact that the subject was scientifically very difficult, the whole problem has been stagnant.

COSPAR accepted the formal invitation of ICSU and the following resolution was adopted by the COSPAR Plenum.

RES. 1 Consultative Group on Potentially Harmful Effects of Space Experiments

In order to carry out the responsibility for careful, objective, quantitative studies of space experiments with potentially undesirable effects on scientific activities and observations, which COSPAR has accepted in response to ICSU resolution 10 (1961) (see Appendix A), the Executive Council decides to establish a Consultative Group on Potentially Harmful Effects of Space Experiments, to consist of not more than six broadly competent scientists having among them specialized knowledge of Astronomy, Radiation Physics, Atmospheric Physics and Chemistry, Communications, Meteorite Penetration and Microbiology, to be named by the President of COSPAR.

It is expected that this Consultative Group will act as a focal point in ICSU for consideration of all questions regarding potentially harmful effects of space experiments on scientific activities and observations, and that in this capacity it would (1) examine in a preliminary way all questions relating to possibly harmful effects of proposed space experiments, including but not restricted to questions referred to it by any of the ICSU Unions; (2) determine whether or not any serious possibility of harmful effects would indeed result from the proposed experiment; (3) in consultation with appropriate Unions, appoint and arrange for convening an ad hoc Working Group or Groups to study any expected effects which are considered to be potentially harmful, such Working Group or Groups to include competent scientists in the appropriate specialized

RES.1 (cont.) disciplines; (4) receive and consider conclusions or recommendations of these ad hoc Working Groups in a timely manner; and (5) prepare final recommendations to the COSPAR Executive Council for its further action.

Positive or negative recommendations or studies considered appropriate by the Council for dissemination would then be made available to all COSPAR adherents, the ICSU Bureau, the appropriate Unions of ICSU, and to appropriate bodies of the United Nations or its specialized agencies.

10. COSPAR Ad-hoc Committee on "constants and ephemerides"

The President reported that he had received a proposal from Dr. Samuel Herrick that a new Working Group be established to deal with constants and ephemeral data and that preliminary consultations had been made with D.H. Sadler, A.A. Mikhailov, W. Fricke, S. Herrick and others.

On the basis of these consultations, COSPAR appointed an ad-hoc committee to act mainly by correspondence between now and the next meeting of COSPAR, with the following tasks:

a) To prepare before 1 February 1963 a list of questions bearing upon constants and ephemerides, which have been brought up by the availability of artificial celestial bodies (satellites, space probes) and artificial signals (radar), considering both the current or future needs and the potential uses for gaining new astronomical knowledge.

b) To list also before 1 February 1963 any suggestions for future conventions on units, definitions, or tables, which may have been put forward by anyone, refraining at that stage from firm recommendations.

c) To bring the lists mentioned in a) and b) to the attention of the organizing committee of Symposium No. 21 of I.A.U., which will be held in the Spring of 1963 in Paris, leaving to the said organizing committee the exclusive right to decide if any of these questions will be discussed at this Symposium, and in what form.

d) To meet for not longer than a day during or immediately after this Symposium.

e) To report before 1 June 1963 to the COSPAR Executive Council on any questions not likely to be covered completely or satisfactorily by the I.A.U. and to make any recommendations for consideration by the Council.

The members of this ad-hoc committee will be:

Cook, A.J.
Department of Scientific
and Industrial Research
National Physical Laboratory
Teddington, Middlesex, U.K.

Herrick, S. (Convenor)
Massachusetts Institute of
Technology
Cambridge 39, Mass., U.S.A.

Kaula, W.M.
Theoretical Division
NASA Goddard Space Flight Center
Greenbelt, Maryland, U.S.A.

Kovalevsky, J.
Bureau des Longitudes
3, Rue Mazarine
Paris 6e
France

Kulikov, D.K.
Institute of
Theoretical Astronomy
Leningrad, U.S.S.R.

Mikhailov, A.A.
Director of the
Pulkovo Observatory
Leningrad, U.S.S.R.

It was further agreed that G.M. Clemence, U.S.Naval Observatory, Washington 25, D.C., be invited to join this group in his function of chairman of Symposium 21.

It was further agreed that a) the General Secretary of IAU be promptly informed of COSPAR's action in this matter; b) that IAU be asked to consider announcing the Symposium No. 21 as being "organized by IAU with the cooperation of COSPAR" (or similar words); it being understood, in that case, that the members of the ad-hoc committee are invited to the Symposium; c) that $1,000.00 be provided from the budget item "meetings of Working Groups 1963" to help support travel or subsistence for this Symposium.

11. COSPAR Preparatory Group to assist in the organization of a Symposium on "The Comparative Biochemistry of Cells"

Dr. Calvin reported that the International Union of Biochemistry was contemplating the arrangement of a special Symposium whose tentative title is "The Comparative Biochemistry of Cells: the extent, origin, and control of Biochemical variability on the Earth and elsewhere". He invited COSPAR to assist in the preparation of this Symposium.

This information was very favorably received by the Executive Council which decided to offer to IUB to co-sponsor this Symposium. To assist in the organization of this Symposium, the COSPAR Plenum approved the establishment of a COSPAR Preparatory Group consisting of : M. Florkin, A.A. Imshenetsky, G. Kuiper, J. Lederberg, Z.R. Mustel and P. Swings, with M. Calvin as "Convener".

It was noted that this Group would bring together biological as well as physical scientists who are interested in extraterrestrial biology. It was suggested that the Eleventh Liège Astrophysical Symposium on the "Physics of the P anets" to be held on 11 July 1962, might provide a first opportunity for a full or partial meeting of this COSPAR Preparatory Group.

12. I.Q.S.Y. Committee

Prof. W.J. G. Beynon reported that at the CIG-IQSY meeting held in Paris, 26-29 March 1962, the following IQSY Committee was nominated to organize geophysical studies during the IQSY 1964-65.

Bureau

President: Prof. W.J.G. Beynon
Members : Dr. M.A. Pomerantz
Dr. N. Pushkov
Prof. G. Righini

Discipline Reporters

Meteorology	-	Dr. W.L. Godson
Geomagnetism	-	Dr. V. Laursen
Aurora	-	to be nominated by IAGA
Airglow	-	to be nominated by IAGA
Ionosphere	-	Dr. W. Dieminger
Solar Activity	-	Prof. M.A. Ellison
Cosmic Rays	-	Dr. S. Vernov
Aeronomy	-	Prof. M. Nicolet

Correspondents

I.W.D.S.	Mr. A.H. Shapley
SCAR	to be nominated by SCAR
COSPAR	2 nominees from COSPAR (Dr. H. Friedman) (Dr. J. Blamont)

Publications, General Administration: Dr. D.C. Martin

Finance: Dr. H. Odishaw

Ex officio members: General Secretary of CIG
General Secretary of ICSU

Scientific Secretary: to be appointed

In addition there may be up to 4 members to help with regional coverage. At the Paris meeting Prof. Ramanathan (India) and a representative of Poland were nominated to two of these places.

Prof. Beynon mentioned that the proposal to establish this IQSY Committee with a special secretariat had been sent to ICSU and he asked for comments from COSPAR.

COSPAR agreed with this proposal and noted that two representatives from the space research field, viz. Dr. H. Friedman and Dr. J. Blamont, had been nominated to the proposed IQSY Committee to act as a link between this Committee and COSPAR.

However, in view of the many suggestions put forward for space research experiments during the IQSY and in order to obtain wider geographical representation for space research, the COSPAR Plenum agreed to recommend to ICSU that Prof. Zdenek SHVESTKA of Czechoslovakia be added to the IQSY Committee as another representative of COSPAR. It was further agreed to recommend to ICSU that the Executive Secretary of COSPAR be included in the IQSY Committee as an ex-officio member to provide good liaison between the IQSY Committee and the COSPAR Secretariat.

13. Next COSPAR Plenary Meeting and Fourth International Space Science Symposium

Members were all agreed that close and active cooperation with International Scientific Unions must be sought in planning meetings and, where suitable, in co-sponsoring Symposia.

After reviewing the list of known meetings for the coming year, it was felt desirable to hold the next COSPAR Plenary meeting combined with a Space Science Symposium in about one year from now.

Members stressed the importance of well publicized and well arranged COSPAR Symposia. It was agreed that the next COSPAR Symposium should be devoted in large part to the subject "Moon, Mars and Venus". This Symposium should be the occasion for a coherent study of this subject which was vastly neglected in the past. The International Astronomical Union should be invited early to participate in the planning of this important Symposium as well as other Unions like IUGG, URSI, IUB and IUBS which are all interested in this subject.

The President read a letter of invitation from Prof. W. Zonn on behalf of the Polish Academy of Sciences, inviting COSPAR to meet next year in Warsaw.

Further invitations from the University of Houston, Texas, and from the Mayor of Florence, Professor Giorgio La Pira, were also presented at the meeting. COSPAR gratefully acknowledged these invitations and accepted the invitation of the Polish Academy of Sciences to meet in Warsaw. It was agreed that the next COSPAR Plenary meeting and Symposium should take place during the first two weeks of June 1963. Prof. Zonn thanked the Committee for accepting the invitation of the Polish Academy.

It was agreed to leave it to the COSPAR Bureau to nominate a Programme Committee for the preparation of the Warsaw Symposium. This Committee should include Prof. S. Manczarski, Scientific Secretary of the Polish National Committee, Prof. W. Zonn, member of the COSPAR Bureau and delegate for Poland, and Prof. Maurice Roy, President of COSPAR.

It was felt desirable to organize during the next COSPAR Symposium a Panel for countries interested in space research on a smaller scale. The Programme Committee for the Symposium should discuss what form this Panel should take.

It was suggested that there may be a definite advantage to try to coordinate the 1963 meeting of the IQSY Committee with the COSPAR Warsaw meeting.

14. Future Developments

The President stressed the close and effective cooperation which must continue between COSPAR and its member Unions. The best method of achieving this effective cooperation is through the close contact of Union representatives with COSPAR and their association to the task of COSPAR. He explained that the future development of COSPAR is closely related to its Working Group structure. He referred to the special groups having specific tasks which were established at this meeting (see sections 9-12 pages 19-23). Reports of the present Working Groups containing resolutions adopted by the full COSPAR are given in Part IV of this Report.

The remark was made that W.G.4 might start now to consider the atmospheres of Venus and Mars in addition to the atmosphere of the Earth. Some members felt however that this was a little premature. It was suggested that this question could be considered by the COSPAR Bureau at its next meeting.

Some members also felt that it would be desirable to establish at the Warsaw meeting a Working Group on "the Moon and the Planets". This matter was left to the COSPAR Bureau with the suggestion that members of the Executive Council might be asked to express their opinions by mail.

15. Votes of thanks

Members learned with great regret of the decisions by Mrs Kallmann-Bijl and Prof. Bartels to resign as chairman respectively of W.G.4 and W.G.2. They expressed unanimous votes of thanks to Mrs Kallmann-Bijl for her extremely devoted work in producing the COSPAR International Reference Tables and in guiding the discussions of W.G.4 . Prof. Kaplan pointed out that the CIRA tables had been of real scientific and practical value

to the international scientific community.

COSPAR also expressed unanimously its thanks to Professor Bartels for his contribution to COSPAR in his difficult task of Chairman of the Working Group on Scientific Experiments. The activities of this Working Group have expanded very rapidly under the quiet and effective guidance of Prof. Bartels.

At the end of the meeting, Prof. Blagonravov expressed his gratitude to Prof. van de Hulst who has presided over the destinies of COSPAR since its inception. He expressed great regret at Prof. van de Hulst's decision to resign as President of COSPAR and he moved a vote of thanks for his untiring efforts during these first difficult years of COSPAR.

All the members associated themselves with Professor Blagonravov's remarks in their thanks and gratitude for the President's unselfish contribution to international science.

Prof. van de Hulst replied that he had greatly enjoyed his work as President and he welcomed the new President, Professor Roy, in his new task. He pledged his continued efforts in the work of the COSPAR Bureau.

The President expressed the unanimous gratitude of the members to the U.S. Space Science Board for their effort in organizing the scientific and business portions of the COSPAR meetings and secondly but equally to the National Aeronautics and Space Administration for their gracious and generous invitations to visit Cape Canaveral, Goddard Space Flight Center and Wallops Island.

He thanked the large staff of assistants for the smooth organization of this COSPAR meeting and he expressed his appreciation for all the courtesies extended to the delegates and Symposium participants.

The President closed the meeting at 3.00 p.m., Wednesday May 9th, 1962.

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Part II - Reports of International Scientific Unions represented in COSPAR

The President mentioned that he had always attached great importance to the problem of achieving an efficient cooperation between COSPAR and its member Unions. He pointed out that the Unions should make full use of their positions on the Executive Council of COSPAR to help to decide upon the scientific policies of COSPAR. In this way duplication of work will be minimized and efficient division of tasks will be achieved.

He called upon each representative of the Scientific Unions to present a report of their activities in relation to the COSPAR work.

16. International Astronomical Union

Prof. H.C. van de Hulst, IAU representative in COSPAR, spoke as follows:

"The results obtained by means of the new tools of space research complement and in some fields already outweigh the results obtained by traditional astronomy. The I.A.U. is convinced of the need for close contacts between the institutes or bodies employing these various methods and wishes to cooperate closely with COSPAR. The practical arrangements are not always obvious but the examples already mentioned in last year's report show how good modes of cooperation can be developed. I.A.U. has one commission specifically devoted to space astronomy, i.e. to observations made by astronomical telescopes placed on satellites or balloons. Furthermore, many of its standing commissions, such as celestial mechanics, magneto-hydrodynamic phenomena, and many others deal also with space research topics. I.A.U. responded to a request from COSPAR to consider the need for a study of the impact of these new methods on the system of astronomical constants and will invite COSPAR to cooperate in a symposium dealing with these questions (see Section 10, page 20). The allocation of frequencies (see Section 27, page 39) is another very important area of cooperation. I do not go into further details in order not to take up too much time."

17. International Union of Biochemistry

Prof. M. Calvin, pro tem representative of IUB, informed COSPAR that the IUB was planning to arrange a special Symposium on "The Comparative Biochemistry of Cells". This raised great interest among the members of COSPAR and an account of the discussion and recommendations by COSPAR on this point is given in Section 11, page 21 of this report.

18. International Mathematical Union

Prof. J.B. Rosser, IMU representative in COSPAR, reported that his Union was very sympathetic with regard to the work of COSPAR. Although there had not yet been opportunities for close participation of the IMU in space research, he expressed the hope that his Union would be able to render greater services in this field in the near future.

19. International Union of Theoretical and Applied Mechanics

Prof. M. Roy, IUTAM representative in COSPAR, presented the following report:

"Since the report presented on the 4th of April 1961, the International Union of Theoretical and Applied Mechanics has continued its activity in scientific problems concerning Space Research as follows:

a) As reported previously, a joint Symposium IUTAM-IUGG-IAMAP has been held at Marseille (France) from September 4 to September 9, 1961. Devoted to the fundamental problems of turbulence in connection with Geophysics, this Symposium dealt with the motion and the structure of the high atmosphere. This Symposium thus complemented the subject which had already been discussed at Varenna (Italy) in August 1960 where the IUTAM Symposium devoted to cosmic gases had been held.

b) IUTAM has organized a Symposium on the Dynamics of Satellites which will be held in Paris from May 28 to May 30, 1962. Its main object is to compare the information obtained from experiments undertaken by the U.S.S.R. and the U.S.A. since 1957 with artificial Earth-Satellites, in order to deduce from the results of these experiments and from their discussion the maximum knowledge of the various forces which really operate on the artificial celestial bodies of this kind. The invited specialists whose number is strictly limited have been greatly interested in the preparation of this Symposium.

c) IUTAM sponsors and has an active interest in the holding of the 3rd International Symposium on the Dynamics of Rarefied Gases which will take place in Paris in June 1962. This Symposium will renew the Second Symposium of this kind held at Berkeley (U.S.A.) in August 1960."

20. International Union of Pure and Applied Chemistry

Prof. Milton Burton, pro tem representative of IUPAC, spoke as follows:

"I should introduce my remarks by the statement that I am a recently appointed pro tem representative of IUPAC and, therefore, can hardly speak authoritatively regarding future plans of the organization which I represent.

Our name implies a wide interest in both pure and applied chemistry. I presume that an interest in chemical problems related to space research, per se, would be considered one of our applied interests. Three international symposia of the Union are planned for this year. None of the presently programmed plenary lectures relate directly to space research. On the other hand, several of the participants have an active interest in COSPAR and it is rather probable that some papers presented at smaller group meetings in connection with the Symposia will deal with subjects specifically important to space research. A quick survey indicates that of nine other international symposia of a chemical nature planned for this calendar year none has any major content connected with space research.

Perhaps the time has come to direct the attention of chemists generally to the ideas that many of their "pure" findings (e.g., in the areas of radiation chemistry, far UV photochemistry, kinetics, spectroscopy, luminescence, energy deposition, excitation transfer, high-pressure and ultra-low-vacuum chemistry, etc.) have some special application for space research and that the possibility of such application should be more consciously realized and stated. It is possible that a Symposium concerned with such matters is now in order. My report to our Executive Secretary shall include this point."

21. International Union of Geodesy and Geophysics

Prof. J. Kaplan, IUGG representative in COSPAR spoke as follows:

"From the very beginning of the existence of COSPAR, I have had the honor of representing the International Union of Geodesy and Geophysics. Both in that capacity and as one of the two vice-presidents of the IUGG, I wish to convey to the President, Professor van de Hulst, our regret that he is resigning as president, and our thanks for the extraordinary judgment and vigor with which he has performed in that significant office. To his successor, Professor Maurice Roy, we pledge our continual and strong cooperation and our best wishes for a successful presidency.

The IUGG plays an unusually significant role in the work of the COSPAR. This is due to the fact that the IUGG comprises seven associations, many of which are as active as most of the other unions of the ICSU. An examination of the COSPAR program for these meetings and those of last week will quickly show that this is true. For example, last week's International Symposium

on Rocket and Satellite Meteorology was sponsored by WMO, IUGG and COSPAR. The International Symposium on the Use of Artificial Satellites for Geodesy was sponsored by COSPAR and the IAG (an association of the IUGG). An examination of the membership of the working groups will quickly show the extent to which the IAGA, the IAMAP and the other IUGG associations are participating in COSPAR. This is true as well of the national representatives and observers.

COSPAR, like the CSAGI, has been an extraordinarily fine special committee of the ICSU. Its success and the sensible and modest actions and advice of its President, should be an example to others when they think of proposing special committees of the ICSU. Because of the excellent work of these two committees and the fine start made by the CIG, we must be very careful not to increase the number of special committees unnecessarily. We must remember too, that unions and associations within unions are constantly re-examining their functions, and to the extent that they can properly expand these, the purposes of special committees should give way. I don't wish here to plead the case for the unions, I simply wish to point out that there is a place both for them and for special committees.

As was the case last year, IAMAP responded well to my call for a contribution to the IUGG report to COSPAR". (The IAMAP statement prepared by Dr. W.L. Godson will be given at the end of this report).

"As I pointed out earlier, IAMAP and IAG have played very significant roles in research in space as brought out in the two symposia last week. With regard to IAGA and its activities as related to the COSPAR, I might point out the WMS as well as other scientific activities of the IAGA as being very close to COSPAR interests. In fact, it's probably safe to say that each of the IUGG seven associations will eventually respond to the IUGG COSPAR representative's request for contributions to this report.

Finally, I would like to call the attention of COSPAR to the forthcoming National Academy of Sciences Symposium on the results of the IGY. This is to be held just prior to the 13th General Assembly of the IUGG during the week of 12 August 1963. The IGY Symposium will be held at UCLA in Los Angeles and the IUGG General Assembly in Berkeley. These meetings should provide opportunities for considerable activity on the part of COSPAR working groups".

IAMAP Statement - prepared by W.L. Godson, Secretary IAMAP

IAMAP wishes to express its gratitude to COSPAR for having given such thorough attention to the views expressed by IAMAP, through Dr. Kaplan, on the occasion of the 1961 Florence meeting. On all points the COSPAR action may be considered timely, helpful and conducive to fruitful collaboration in the future.

a) IAMAP Activities of interest to COSPAR, 1961/62.

As indicated previously, three symposia of interest to COSPAR were held in 1961 - one on Ozone in Arosa in August, one on Radiation in Vienna in August and one on Turbulence in Geophysics in Marseilles in September. The first has been reported briefly in IUGG Chronicle No. 39, pp. 228-9, and it is expected that reports on the other two will appear in the near future in the same publication.

Mention could also be made of the meeting in Paris in April, 1961, of the Inter-Union Committee on Radio Meteorology (URSI is the parent union). This meeting has been reported in some detail in the IUGG Chronicle - No. 38, pp. 189-202, and No.39, pp. 225-227. Particular topics of direct concern to space science are referred to on pp. 193-4 and pp. 201-2 of No. 38 and p. 227 of No. 39.

b) IAMAP activities of interest to COSPAR, 1962/63.

There are tentative plans for an international symposium on atmospheric electricity, to be held in late August or early September, 1962, at a site which has not yet been selected (full information will appear in the IUGG Chronicle at the earliest possible date). It is proposed to devote a special session to space electricity.

c) Survey of activity in Satellite Meteorology

Research programs conducted in 1961 fall into three categories:
(1) Analyses of cloud pictures from the TIROS satellites, (2) analyses of radiation data from the satellites, and (3) basic research on the radiative characteristics of the atmosphere in specific spectral regions.

The striking cloud patterns photographed by TIROS are the subject of intensive study. The pictures showed large-scale cyclonic vortices (or storms)sometimes more than a thousand miles in diameter; these were sometimes associated with the cloud patterns of frontal zones and jet streams, and often the spiral cloud bands paralleled the wind flow. This knowledge has been useful for interpreting pictures of clouds photographed over

remote ocean areas, and for improving standard meteorological analyses both in remote ocean areas and over land areas.

Studies of TIROS cloud data are making contributions towards an increased understanding of the physical processes associated with several other phenomena. Cellular arrangements of clouds over ocean areas have been linked to the vertical temperature structure of the atmosphere and tentatively to the transfer of energy and moisture from the ocean surface to the atmosphere. Long, narrow lines of clouds, or cloud "streets" seen in TIROS pictures have been associated with the wind field. The pictures of cloud cells and "streets" are being compared with conditions prescribed by theory or prevailing in laboratory experiments.

The pictures are also used in advancing the study of tornadoes and hail storms. These studies have already indicated that such storms are often embedded in quasi-isolated clouds which are very bright and have a dimension of 100 to 200 miles.

Other phenomena revealed in TIROS pictures are snow cover and clouds in mountain regions, ice on bodies of water, and sun "glint" on the oceans, seas, and rivers. These pictures are or will be under study to determine the meteorology of remote mountain regions, the possibility for using the satellites for routine ice reconnaissance, and to measure sea conditions and surface winds over sea and ocean areas.

The radiation data from TIROS II and Explorer VII are being used in studies of the heat budget as a source of energy for the general circulation. The TIROS measurements in the 8 to 12 micron water-vapor window are being used in studies to determine the heights of overcast cloud tops from their radiation temperatures, and in studies of the temperature distribution at the Earth's surface.

Basic research on the infrared transmission characteristics of atmospheric gases is a major program. The results of this research are being used to evaluate infrared data being acquired by TIROS, and in the development of future meteorological satellite experiments, such as the determination of the vertical temperature structure of the stratosphere and upper troposphere from spectral measurements of CO_2 emission.

TIROS III, the third experimental meteorological satellite, was launched from Cape Canaveral, Florida, on July 12, 1961, in order to be operational during the hurricane season. During the period July 12 to October 12, TIROS III photographed tropical cyclones, including hurricanes and typhoons, on more than fifty separate occasions. Five hurricanes and one tropical storm were seen in the Atlantic; two hurricanes and a tropical storm were seen in the eastern Pacific. Typhoons Kathy through Tilda, nine storms in all, were followed over the central and western Pacific.

A total of fifty advisories on these tropical storms, and other significant weather patterns, was phoned, radioed, or other wise transmitted to USWB, USAF or USN interests at Miami, San Francisco, New Orleans, San Juan, Guam, Honolulu, and Tokyo, and to the weather services of Mexico, the Philippines, Japan, Hong Kong, and the Republic of China.

Hurricane Esther, by means of TIROS III pictures, was discovered at 11°N, 30°W at 1:00 P.M.EST, September 10, 1961 before any other inkling of its existence was known. Thus, Esther became the first fully developed hurricane ever discovered and reported operationally by a meteorological satellite. Had the meteorologists at the data acquisition station had more experience with the appearance of tropical storms as viewed from space, hurricane Anna might have been the first satellite discovery of a hurricane operationally. Post analysis undertaken during research showed that the tropical storm, which developed into hurricane Anna could have been identified on July 17, 1961, two days before conventional data revealed her presence. The early detection of tropical storms is potentially significant for the study of the causative mechanisms responsible for hurricane formation. An interesting set of high resolution color pictures of hurricane Debbie was also obtained from a Project Mercury movie camera.

During the year an International Meteorological Workshop was held from Nov. 13 to 22nd in Washington, D.C., and sponsored jointly by the U.S.Dept. of Commerce Weather Bureau and the National Aeronautics and Space Administration.
The purpose of the workshop, attended by 35 participants from 27 nations, was to acquaint other meteorologists from many countries with the results of the satellite program and the possibilities for the future. This meeting consisted of three days of laboratory sessions, including actual work with the pictures and radiation data from the TIROS satellites. This was followed by brief talks by the visitors relating experience with the satellite data in the various countries. Following the formal program there were tours to the satellite data acquisition stations, to Goddard Space Flight Center and to the Weather Bureau's Meteorological Satellite Laboratory. Several enthusiastic reports have already been received regarding the usefulness of the International Meteorological Workshop.

The proceedings of the Workshop are being prepared for publication. Preliminary reports have already appeared in (1) International Meteorological Workshop - Reprints and Papers, (2) International Meteorological Workshop Abstract of Figures and Lectures.

In 1962, plans will continue for the Nimbus satellite which will be Earth oriented in a quasi-polar orbit. This will permit the acquisition of photographs of the entire Earth once each day near local noon; it will also allow infrared measure-

ments to be made twice a day everywhere, once in daylight and once at night. Thus, Nimbus will more nearly fulfill operational and research requirements for a global observational capability of some atmospheric parameters.

d) Survey of activity in Meterological Rockets.

A rocket network of eight stations to measure atmospheric temperature and winds up to 60 km or more has been established in North America. Some early results have been reported, and complete data tabulations are made available at the earliest possible moment. Although many difficult problems still remain before reliable observations can be obtained regularly, synoptic measurements of wind and temperatures to elevations of more than 50 km have been obtained. These show interesting variations in the wind field from day-to-day, especially in the region near 60 km in September, perhaps suggesting the existence and movement of cyclonic systems there. The marked seasonal changes of winds - from the east in summer and from the west in the winter - is evident in both the middle and upper stratosphere (20 to 50 km). An interesting feature is the sharp wind speed maximum at 50 km at Cape Canaveral. The region of this wind maximum changes with latitude and season.

Efforts to improve the measuring techniques, and to improve the regularity and reliability of individual flights are continuing. Emphasis is laid not only on improved sensors but also on more accurate data reduction and data correction techniques.

22. International Union of Pure and Applied Physics

Prof. J. Blamont was requested at a very late date to act as pro tem representative of IUPAP at the COSPAR meetings. A report from this Union was not available.

Sub-Commission for Cosmic Ray Intensity Variations (SCRIV) of IUPAP

The President reported that he had received from the Secretary of the Cosmic Ray Commission a letter stating that the activities of SCRIV would in the future be handled by the Cosmic Ray Commission of IUPAP. This letter suggested that the presence of a representative of the Commission at COSPAR meetings would provide an effective channel of communication between the active workers in Cosmic rays and COSPAR. Following this suggestion the Cosmic Ray Commission was invited to send an observer to the COSPAR meetings. However, no notification of the appointment of an observer was received.

Dr. Sarabhai, Secretary of SCRIV, felt that the coordination of activities in cosmic rays could be achieved by naming a representative of the Cosmic Ray Commission to Working Group 2 of COSPAR and to the Panel on Synoptic Rocket Soundings.

The President recalled that until now members of COSPAR Working Groups have been named for their knowledge and activity in particular fields and that COSPAR had avoided to appoint as members of Working Groups representatives of bodies or organizations.

Dr. Sarabhai pointed out that Unions have very diversified interests and that it is sometimes difficult for the work of a Commission to be adequately reported.

It was generally agreed that the Union representatives to COSPAR should take the necessary steps to be informed of the interests of the various sub-groups within their Unions and these Subgroups or Commissions of Unions should prevail upon their Union representative in COSPAR to have their views reported to COSPAR Working Groups.

23. International Scientific Radio Union.

Prof. W.J.G. Beynon, pro tem representative of URSI, spoke as follows:

"At the XIIIth General Assembly held in London in September 1960, URSI established a Committee for Space Radio Research the membership of which consists, in the main, of representatives from each of those URSI Commissions concerned directly with space radio research. This Committee was given the responsibility of coordinating URSI's interest in space radio research and also charged with organizing, between General Assemblies, such specialist symposia as was considered desirable. Since the last meeting of COSPAR one such symposium has been held, and a brief account of the meeting forms the main topic of the present report.

The symposium was devoted to a discussion of the scientific and research problems of satellite radio communication systems. By kind invitation of the French National Committee of URSI the meeting was held in Paris over a period of 5 days in September 1961. A total of 116 delegates and about 50 observers from some 12 countries participated. Although the meeting was organized under the auspices of URSI, COSPAR was kept fully informed of the arrangements and the President of COSPAR was present at the meeting. Some 37 papers were presented and the main topics discussed were:

(i) the launching, attitude control and tracking of communication satellites

(ii) problems of radio frequency allocation, interference and propagation

(iii) radio equipment for communication satellites

(iv) ground based radio equipment for communication satellites

(v) modulation systems

(vi) specific Communication systems (including satellites in random orbits, synchronous orbits, orbiting dipoles, etc.)

(vii) various miscellaneous aspects of communication satellites such as the economics of such systems and transmission-time problems.

It was generally agreed that the meeting was very successful and the full texts of the papers, together with an account of the discussions, is about to be published by URSI in the form of a monograph entitled "Space Communication Research".

Two other space radio research matters involving URSI on which I wish to report to COSPAR are the following:

The first concerns the application of information theory to space research experiments.
At some time between now and the 1963 URSI General Assembly, possibly during the Assembly itself, the URSI Space Radio Research Committee plans to organise a meeting to discuss the problem of the most efficient transmission of information in space experiments -- and a small group under the chairmanship of Professor Silver of the USA is being invited to consider organising such a meeting.

Secondly I think COSPAR may wish to note the fact that, in the various Commission programmes which have just been drafted for the forthcoming Tokyo General Assembly of URSI, the subject of radio in space research figures quite prominently. Thus Commission II is scheduled to discuss tropospheric problems which may bear space communication; Commissions III and IV will discuss the electron distribution to the greatest heights including all data obtained from rockets and from satellite top side sounders; Commission V will discuss the radio astronomy of the solar system, including a consideration of radio astronomy from space vehicles; Commission VI will discuss the topics I have already mentioned, viz., information theory and space research experiments and also problems of data processing, including circuits for data processing and the application of these in space experiments; Commission VII topics include the applications of lasers and masers in radio science, the subject of plasmas in both geophysics and astrophysics and the question of satellite communication devices. From this brief report I hope it will be evident that URSI is certainly active in its consideration of the many problems involving radio waves and space exploration."

Part III - Relations with International Organizations

A. ICSU and Committees established by ICSU

24. ICSU

The President was very pleased that Prof. J. van Mieghem, General Secretary of ICSU could be present at the meetings as a representative of the ICSU Bureau. He invited him to speak on the relations between ICSU and COSPAR.

Prof. van Mieghem informed the members of the progress made with regard to a problem of common interest and of particular importance, namely the problem raised by the UN Resolution 1721 (XVI) (See Appendix B, page 93).
Prof. van Mieghem said:

"The following proposal, which has already met the approval of the Bureau of ICSU (Rome 9-12 April 1962), will be presented in due course by the Secretary General of ICSU to the Members of the Executive Board for final approval:

A joint WMO-ICSU Committee on Atmospheric Research on which WMO, UNESCO, all interested International Scientific Unions, Inter-Union Committees and Scientific Committees would be represented, should be established. The joint Committee would have the following terms of reference:

(a) to examine all scientific aspects of the objectives mentioned in part C of the UN Resolution 1721 (XVI) and to submit recommendations to the appropriate higher bodies of the two organizations, on the scientific problems that have to be solved in order to implement the resolution;

(b) to list specific research tasks which have to be performed to advance the physics and mechanics of the atmosphere and to keep up to date the list of these tasks;

(c) to endorse proposals volunteered in support of these research tasks;

(d) to examine all possible consequences of upper atmospheric pollution in terms of potential changes in the physical and chemical properties of the upper atmosphere and the possibility of downward propagation of these changes to the surface layers;

(e) to evaluate, at appropriate intervals of time, the progress achieved and to recommend, in the light of the results attained, the discontinuance or reorientation of parts of the research tasks that have been listed (see (a)).

The Working Arrangements between WMO and ICSU make Specific provision for the establishment of a Committee such as the one proposed above.

As expected, an agreement between ITU-ICSU has been signed. A joint ITU-ICSU committee, similar to the WMO-ICSU joint committee with proper membership could now be set up to supervise the implementation of part D of UN Resolution 1721 (XVI) and advise on the scientific aspects of ad hoc problems or, alternatively, the WMO-ICSU joint committee could be expanded into a WMO-ITU-ICSU joint committee with an enlarged membership and appropriate additional terms of reference.

To ensure efficient operation of the Committee, the number of permanent voting members would be small, say 8. Each of these permanent members would have a variable number of advisors depending on the need of the member. Furthermore, organizations not permanently represented on the Committee would be invited to participate in meetings, in an advisory non-voting capacity. The Committee would meet at least once a year."

Prof. van de Hulst thanked Prof. van Mieghem for his informative report and recalled that COSPAR is in every respect dependent upon the health and vigor of ICSU. He expressed his appreciation of the good mutual relations between COSPAR and ICSU and reaffirmed the importance of continued close cooperation between them.

Dr. Rose thought that the COSPAR Executive Council should continue to consider very carefully the question of the U.N. Resolution 1721 (XVI) since it involves relations of COSPAR with several Specialized Agencies of the United Nations.

25. Comité International de Géophysique (C.I.G.) and the International Quiet Sun Year (IQSY)

(see also Section 12, page 22-23)

Prof. W.J.G. Beynon, President of C.I.G., spoke as follows:

"The International Committee for Geophysics (CIG) was formed by the International Council of Scientific Unionsin 1959. It is an inter-Union Committee with representation from four Scientific Unions, -- those of Geodesy and Geophysics, Scientific Radio, Astronomy and Pure and Applied Physics. In addition there are representatives of other Special or Scientific Committees of ICSU and of certain other international organizations such as the World Meteorological Organization. Under its Rules (as formulated by ICSU) one of the main functions of the Committee is "to develop and coordinate international plans for the furtherance of cooperation in geophysics and related sciences, especially those of an inter-disciplinary nature".

Just over a year ago CIG made the formal proposal to ICSU that at the period of next solar minimum activity, in 1964-65, a renewed international enterprise should be organized and the title suggested for the project was "The International Quiet Sun Year (IQSY)". The proposal was considered by the ICSU General Assembly meeting in London last September and received the unanimous and very warm support of that meeting and ICSU charged CIG with the responsibility for organizing the International Quiet Sun Year.

A month or so ago CIG called the first meeting of representatives of nations to consider the organization of IQSY and some 25 nations were represented. Arising from this meeting a recommendation has gone forward to ICSU that a new Committee be established under CIG, to organize IQSY with W.J.G. Beynon as President and with a special IQSY Secretariat established in London. The following disciplines are represented on the IQSY Committee -- Meteorology, Geomagnetism, Aurora, Airglow, Aeronomy, Ionosphere, Solar Activity, Cosmic Rays. All these disciplines will, of course, be concerned with space experiments during IQSY and to coordinate the space research aspects of the IQSY program, and to act as a link between the IQSY Committee and COSPAR, we nominated to the Committee two representatives from the space research field, viz., Dr. Friedman and Dr. Blamont. With these two representatives, one for rockets and one for satellites, we hope to ensure that a close liaison between the IQSY Committee and COSPAR will be established.

One point should be mentioned here viz., that in view of the exceptionally rapid fall in solar activity we decided to start IQSY on 1 January 1964 instead of 1 April 1964. Hence the IQSY will now start on 1 January 1964 and end on 31 December 1965.

At our Paris meeting last month we established Working Groups in each of the disciplines and instructed each Group to give particular attention to the space research aspects of their IQSY proposals. Each discipline Working Group was also asked to supply the COSPAR Correspondent on CIG (Dr. Bartels) with a report covering space research discussion on their discipline so that Dr. Bartels would be in a position to report fully to COSPAR on the many aspects of space research in relation to IQSY discussed at our Paris meeting.

At this meeting the relevant COSPAR groups have considered further, and when necessary elaborated and added to, these suggestions which we, in CIG, put forward for space research work during IQSY. As President-designate of the IQSY Committee I should like to express now my complete confidence that the IQSY Committee and COSPAR will cooperate closely to ensure that the International Quiet Sun Years of 1964-65 are a worthy successor to the IGY of 1957-58."

26. Scientific Committee on Antarctic Research (SCAR)

Dr. H. Wexler, representative of SCAR, made the following statement:

"The Scientific Committee for Antarctic Research (SCAR) is greatly interested in those aspects of COSPAR's activities which relate to the problem of Antarctic research and logistics. These include the following:

a) Information from meteorological satellites on:

Cloud distribution

Radiation Balance

Distribution and movement of sea ice and perhaps some indication as to ice thickness (from IR data?)

b) Navigation satellite which would assist in navigation to and from Antarctica as well as within Antarctica.

c) Geodetic satellite to obtain absolute geodetic positions in Antarctica.

27. Inter-Union Committee for Frequency Allocations for Radio Astronomy and Space Science (IUCAF)

Prof. van de Hulst mentioned that he had been asked to report on IUCAF at the COSPAR meeting as one of the representatives of COSPAR on IUCAF. He recalled that this Committee brings together representatives of URSI, IAU and COSPAR, and was formed to strengthen and coordinate the efforts to obtain sufficiently clear and sufficiently wide frequency bands allocated to radio astronomy and to space science.

Two meetings of IUCAF were held in the past twelve months. IUCAF maintains a continuous review of the situation with respect to proposed allocations and studies the requirements on tolerable levels of man-made interference, etc. There is some satisfaction in the facts that pure scientific research is now regarded as a service and that the European Broadcasting Conference made channel 38 in television band V (from 606-614 MC/s) largely free for radio astronomy.

However, the main worries still remain and administrators and scientists in many countries should realize, that this is a matter of survival of these branches of science.

Most of the work in the recent IUCAF meetings was directed to preparing for the Extraordinary Administrative Radio Conference of ITU which will take place in Geneva in October 1963.

IUCAF has pressed for placing Radio Astronomy also on the agenda of this meeting, which is primarily devoted to space communications.

28. International World Day Service (IWDS)

Dr. A.H. Shapley, IWDS representative to COSPAR, recalled that the IWDS is an inter-Union commission of ICSU comprised of the following Unions: IAU, IUGG, and URSI.

The basic program of IWDS comprises (1) issuance of International Geophysical Calendars, (2) development and operation of plans for Geophysical Alerts and Special World Intervals, and (3) preparation of Calendar Records of Solar and Geophysical highlights for each year.

Dr. Shapley explained that the cooperation of IWDS with COSPAR had been with respect to the International Geophysical Calendars. For example in the 1962 Calendar, World Synoptic Intervals have been marked for synoptic meteorological rocket programs as designated by COSPAR and WMO. He mentioned the close cooperation of IWDS with COSPAR Working Groups.

He referred also to the cooperation of IWDS with the URSI Central Committee on Ursigrams and to the use of the IWDS/CCU rapid communication arrangements for distributing satellite information known as the SPACEWARN network.

Dr. Shapley who is the COSPAR Correspondent for SPACEWARN presented to Working Group 3 of COSPAR a report on activities and an assessment of the SPACEWARN network in 1961 (See Section C, page 79 and Appendix D, page 105).

B. Relations with Organizations outside the ICSU structure

29. United Nations Organization

The President mentioned that the U.N. Secretariat had been kept informed of COSPAR's activities and that the U.N.Committee on the Peaceful Uses of Outer Space had been invited to send representatives to this meeting.

COSPAR considered Resolution 1721 (XVI) adopted by the General Assembly of the United Nations (See Appendix B,page 93), and noted the requests made to the U.N. Committee on the Peaceful Uses of Outer Space and to certain Specialized Agencies of the U.N. The President called attention to the specific mention made of ICSU and COSPAR in Parts C and D of this Resolution dealing respectively with meteorology and space communication.

Part C was discussed by Prof. van Mieghem, ICSU observer and Dr. H. Wexler, WMO observer in their reports to COSPAR (see Section 24, page 36/7 and Section 31, page 44).

With reference to Part D. of the U.N. Resolution, it was noted that IUCAF coordinates the interests of COSPAR, URSI and IAU in obtaining sufficiently clear and wide frequency bands for radio astronomy and space science (see Section 27, page 39).

COSPAR reaffirmed its readiness to assist the U.N. in any matters within its competence.

The Executive Council discussed the possibility that COSPAR might be asked to help in organizing the scientific part of an International Conference on the Exploration of Outer Space, which may be called by the U.N. Committee on the Peaceful Uses of Outer Space. The Executive Council felt that COSPAR could assist in the preparation of the scientific part of this Conference so far as it can do so within its Charter and the ICSU regulations. In this connection, the COSPAR Plenum reiterated Resolution 1 (1960) adopted at the Nice Meeting of COSPAR.

Res. 1 (1960) Offer of Services to U.N.

The Committee on Space Research (COSPAR) established by the International Council of Scientific Unions,
Noting with great satisfaction the resolutions passed by the General Assembly of the United Nations Organization to form a Committee on the Peaceful Uses of Outer Space and to convene an international scientific conference for the exchange of experience in the peaceful uses of outer space,
Offers in any matters within the competence of COSPAR such services of COSPAR as the said Committee or the Secretary-General of the United Nations Organization may desire, and
Instructs its President to make available to the Secretary-General of the United Nations Organization any information on the COSPAR scientific activities which may seem useful towards an efficient cooperation.

30. UNESCO

In welcoming Dr. E.M. Fournier d'Albe, the UNESCO observer, the President referred to the useful informal contacts he had in the past year with the office of the Natural Sciences Department of UNESCO. He acknowledged with thanks the help of UNESCO in providing again this year a contract whereby financial assistance could be given to scientists from distant countries to come to the Washington Symposium.

Dr. Fournier d'Albe made the following remarks on the relations between COSPAR and UNESCO:

"Earlier during this meeting, it was stated that the Executive Council had agreed on the nature and function of COSPAR as an international non-governmental body. It is a more difficult task to define the nature and functions of UNESCO, but one can at least say that, as distinct from COSPAR, it is an intergovernmental organization and moreover one which is almost world-wide in its membership. These differences between our two institutions may guide us in deciding the nature of the partnership which can and should exist between them.

Perhaps I should say first of all that UNESCO is not especially interested in space research as such. Its objective has been defined as the attainment of peace, through education, science and culture, and it is for this reason that we have a programme in space science, because the scientific exploration of space requires international cooperation. It is already bringing the nations of the world closer together and we hope that this process will continue in the future.

UNESCO will not therefore in general take the initiative in the scientific or technical aspects of space research. This is COSPAR's role. However, as a world-wide inter-governmental organization, UNESCO can play an important part in translating COSPAR's ideas into action.

As far as we can see at present, there are three ways in which we may do this:

(a) by supporting symposia and other scientific meetings for the exchange of information on the results of space research; this we are already doing.

(b) by contributing towards the costs of Working Groups and other meetings of experts for the planning and coordination of research at the international level.

(c) by assisting governments and scientific institutions, particularly in the newly-developing countries, to participate in the international endeavour by carrying out the recommendations of bodies such as COSPAR; this UNESCO may do by providing the services of experts, by offering fellowships for advanced training, and perhaps also by providing scientific equipment.

The fields in which action of this kind by UNESCO may be appropriate appear to be the following:

(i) Satellite tracking

Your Working Group on this subject, whose meetings I was kindly invited to attend, has made several recommandations for action which may be supported by UNESCO, including the planning of observations

of the new geodetic flashing satellite.

(ii) Geophysical observations in support of satellite experiments

In order to reap the full benefit of the artificial satellite as a research instrument in geophysical studies, an adequate network of surface observatories is essential. Our consultations with many experts have shown that there is still room for improvement in the world networks of astronomical, geomagnetic and ionospheric observatories. We hope that UNESCO will be able to assist its Member States in setting up new observatories, or in improving existing ones, wherever there is a real need to do so.

(iii) Space Biology

It is perhaps premature to speak of space biology (or exo-biology) before any proof has been obtained of the existence of living matter outside the Earth. However, it already seems probable that such life exists, and there is no doubt that its eventual discovery will have repercussions far beyond the limits of space research or even those of biology. They will concern humanity in general and thus UNESCO. We shall therefore follow with great interest the work of COSPAR in this field and in particular that of the preparatory group which has been set up to assist the International Union of Biochemistry in planning the symposium on the comparative biochemistry of cells.

(iv) Atmospheric Sciences

UNESCO will offer its full collaboration in the work of the WMO-ICSU Committee on Atmospheric Research, including the study of the possible effects of the contamination of the upper atmosphere by rocket exhaust gases and other chemicals.

(v) Hydrology

Another field in which we expect to collaborate closely with WMO is exploring the use of photography from satellites of the TIROS and NIMBUS series in the study of the snow cover of mountain areas, and in the evaluation of water resources available in this form.

(vi) Data and Publications

Lastly, I should mention the important problem of data handling, analysis and publication.

UNESCO has for several years been assisting the Federation of Astronomical and Geophysical Services and is concerned to see these important services functioning efficiently and with adequate resources. The tremendous volume of data now being received from satellites and space probes raises new organizational problems which must be solved if the effort put into acquiring these data is not to be wasted."

The President thanked Dr. Fournier d'Albe for his report and also for his participation in the work of COSPAR Working Groups. Prof. van de Hulst added that whenever COSPAR reaches the stage of regional cooperation, he hoped that UNESCO would be able to offer to COSPAR the services of its regional centers.

31. W.M.O.

The President called on Dr. H. Wexler, the WMO observer, to report on WMO activities in relation to COSPAR. He remarked that COSPAR had always made efforts to cooperate closely with WMO and he noted with pleasure the joining of forces of COSPAR with WMO in organizing the First International Symposium on Meteorological Rockets and Satellites which had just taken place also in Washington. He hoped that this Symposium would form a basis for a continued cooperation.

Dr. Wexler referred to Part C of Resolution 1721 (XVI) of the United Nations (see Appendix B, page 93) and spoke as follows:

"In fulfilment of the U.N. Resolution 1721 (XVI), Mr. D.A. Davies, Secretary-General of the World Meteorological Organization (WMO), requested the services of two advisers, Dr. V.A. Bugaev, Assistant Director of the Hydrometeorological Service of the U.S.S.R., and Dr. H. Wexler, Director of Research, U.S. Weather Bureau. These two men collaborated for several weeks in writing a report devoted mostly to the forecasting portion of the Resolution. During the week of April 3rd, they were joined by ten other scientists including representatives of UNESCO, ICSU, IUGG/IAMAP, IAEA and ITU/CCIR to discuss primarily the atmospheric science portion of the report. From these meetings, a first draft of the report called for by the Resolution has been prepared which will be reviewed by the WMO Panel of Experts on Artificial Earth Satellites and other scientists, at a meeting in Geneva beginning May 22nd and then by the WMO Executive Committee beginning May 29th. This report will contain four main recommendations:

(i) Development of an Internationally Coordinated Plan for Meteorological Satellites designed to achieve optimum coverage from operational meteorological satellites to be launched by various countries and

to provide for the coordinated collection and international dissemination of data both for operations and research.

(ii) Establishment of a "World Weather Watch," a design of a global meteorological observing and prediction system based on a system of world and regional centers to avoid duplication in preparation of weather analyses and prognoses but still make available to the meteorological service of each country the processed material and raw data, both conventional and satellite - that it requires to carry out its responsibilities.

(iii) Augmentation of the Present Network of Conventional Meteorological Observations in areas where they are sparse or non-existent. Satellite observations alone, despite their global coverage, do not yield the quantitative data needed for modern mathematical modeling of the atmosphere. Conventional observations, despite their quantitative character, cannot be practicably extended to give the desired global coverage. But the proper blending of both satellite and conventional observations can yield an optimum world observing system. Accordingly, the plan calls for the establishment of about 50 additional upper air balloon sounding stations, mostly in the southern hemisphere and the tropics, to be located either on islands or stationary ship weather stations. Implementation of the plan would require substantial funds but in view of its importance for world weather studies and predictions, it is hoped that the necessary support can be provided.

(iv) Formulation of an "International Atmospheric Sciences Program" by a proposed joint WMO-ICSU Committee, terms of reference of which were furnished Professor J. van Mieghem, Secretary-General of ICSU, who was also present.(See Section 24, page 36 of this report)
This joint committee would study the scientific portions of the objectives described in Part C of the U.N. Resolution and with the assistance of other scientists and scientific bodies would stimulate research.

IQSY - The proposed meteorological program for the International Years of the Quiet Sun, 1964 and 1965, will be presented to the WMO Executive Committee meeting, beginning May 29. In addition to meteorological satellites which will be in operation during that period, it is hoped that there can be established a reasonably complete northern hemisphere network of meteorological rocketsondes to study the very interesting temperature wind

patterns existing between 30 and 60 km which, judging from sporadic and localized evidence, may differ widely from patterns observed in the lower layers reached by radiosondes.

CIRA - Regarding the COSPAR International Reference Atmosphere, a liaison is to be established between COSPAR Working Group 4 and the WMO. This liaison will be facilitated also by recommendation made by the WMO Commission for Aerology to establish a Working Group on Synthesis of High Atmosphere Data with emphasis on the layer from 30 to 120 kilometers, with special attention given to latitudinal, longitudinal and seasonal effects.

SPACEWARN - Referring to the recent Resolution passed by the Commission for Synoptic Meteorology on this topic, contents of which were transmitted to the reporter, Mr. A.H. Shapley, (See item iii, page 79)attention was directed to the heavy volume of meteorological traffic on meteorological telecommunications circuits and that it would facilitate matters greatly if COSPAR could abbreviate the SPACEWARN codes.

ISRSM - A three day meeting of the First International Symposium on Rocket and Satellite Meteorology (ISRSM) was held in Washington, D.C., April 23-25, and appeared to be an outstanding success. Sponsored by the WMO, the IUGG/IAMAP and COSPAR, the meeting attracted over 350 participants from 32 countries and 34 speakers were included in the program. In contrast to the crowded program at the third International Space Science Symposium, there was ample time for discussion following the papers of the ISRSM.

Plans are underway to publish the Proceedings of the ISRSM along with the two other COSPAR-sponsored Symposia (Geodetic Satellites and the Space Science Symposium) by the North-Holland Publishing Company, Amsterdam.

32. International Telecommunication Union (ITU) International Radio Consultative Committee (CCIR)

The President reported that observers from ITU and CCIR had been invited to attend this COSPAR meeting. These organizations have both expressed their regrets that is was not possible for them to be represented on this occasion owing to the fact that meetings of these bodies were held during the period of the COSPAR meeting. They reiterated their keen interest in the work of COSPAR and requested that the documentation of the COSPAR meeting be sent to them.

33. International Astronautical Federation (IAF)
International Academy of Astronautics (IAA)

Dr. M. Summerfield, observer for IAF, mentioned the importance for COSPAR and the IAF to be informed of each other's activities. The Federation was founded in post-war years and is now approaching its 13th Congress which will be held this year in Sophia. He explained that the program of this Congress would be centered largely on engineering topics. Nevertheless, these are subjects of common interest which should be kept in mind in order to avoid duplication. He expressed the hope that coordination of COSPAR and IAF activities would be continued in the future.

Dr. A. Ehmert, observer for IAA, recalled that the IAA was a very young organization which is part of the IAF. The principal functions of the Academy are to advise the President of the IAF on technical matters, to hold scientific meetings and make scientific studies and reports, and to carry out such other projects as may be deemed desirable for promoting the advancement of astronautics. He informed COSPAR of plans to hold a Symposium on Basic Environmental Problems of Man in Space in Paris from 29 October to 2 November 1962. This Symposium will be sponsored jointly by IAF and IAA with the support and cooperation of UNESCO.

34. European Preparatory Commission for Space Research (COPERS)

Prof. van de Hulst, Vice-President of COPERS, reported onthis organization, recalling its origin and development. COPERS now groups eleven countries of Western Europe which wish to coordinate their efforts in space research exclusively for peaceful purposes. The final convention for ESRO, the "European Space Research Organization", will probably be signed in one month from now.

ESRO will plan rocket and satellite experiments like any individual country. However, plans for satellite experiments will come much later. The launching site for rocket experiments will be in Kiruna, Sweden. Prof. van de Hulst expressed the wish of COPERS to cooperate with COSPAR on all appropriate points and hoped that regular reports of ESRO would be submitted at each COSPAR annual meeting.

35. Provisional Inter-American Committee for Space Research

This Committee was constituted at the end of 1960 and its main task was to find out what a permanent committee could do to promote space research in the countries of Latin America.

Dr. Roederer suggested that COSPAR continue to keep close contact with the scientists of Latin America and that it was not yet clear whether this Provisional Committee would be a coordinating group for the activities and interests of these scientists.

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PART IV - COSPAR WORKING GROUPS

36. General

The Executive Council carefully considered the present Working Group structure of COSPAR. The President noted that Working Groups can be established or discontinued by COSPAR at any time. This ephemeral character reflects the need for flexibility in view of the changing scientific problems and is not a sign that the Working Groups are unimportant. They form the backbone of COSPAR.

He suggested that decisions about the future working group structure in COSPAR might be guided by the following principles:

a) What is not necessary for a valid scientific reason is not necessary at all;

b) What falls relatively well under the competence of one particular Union had best be left to the Union, or, if so desired under special auspices of COSPAR;

c) Formation of COSPAR Working Groups in typical inter-Union fields should be based first of all on assessment of needs and availability of personnel, and it may be hoped that finances will never form the real bottle-neck.

The full COSPAR accepted and approved the reports of all four Working Groups which met in separate sessions during the COSPAR meetings. New Chairmen were appointed for W.G.2 and 4 and changes were approved in the title of W.G.2 and a sub-structure was established for W.G.4. Details are set out under the reports of the individual Working Groups (Section 37 to 40, pages 51-90).

The entire list of Working Groups and Sub-groups after the Washington meeting is as follows (the full membership of Working Groups is given under the reports of individual Working Groups):

Working Group 1 on Tracking and Telemetry

Chairman: Mrs A.G. Massevitch

a) Sub-Group on Optical Tracking:

Chairman: Prof. F. Whipple (U.S.A.)

b) Sub-Group on Radio Tracking and Telemetry:

Chairman: Mr. J.A. Ratcliffe (U.K.)

Working Group 2 for the I.Q.S.Y.

Chairman: Dr. H. Friedman

Correspondent for:

Aeronomy and Aurora	:	Prof. S.M. Poloskov (USSR)
Ionosphere	:	Prof. W.J.G. Beynon (UK)
Meteorology	:	Dr. H. Wexler (USA)
Geomagnetism and Cosmic Rays	:	Prof. J.D. Kalinin (USSR)
Solar Activity and the Interplanetary Medium	:	Dr. H. Friedman (USA)

a) Panel on Synoptic Rocket Soundings

Chairman: Prof. J. Blamont (France)

b) Panel for Polar Cap Experiments

Chairman: Dr. B. Landmark (Norway)

Working Group 3 on Data and Publications

Chairman: Prof. A.P. Mitra

Correspondent for:

SPACEWARN	:	Dr. A.H. Shapley (USA)
Data Interchange and World Data Centers	:	Dr. H. Odishaw (USA)
COSPAR Publications	:	Dr. B.G. Pressey (UK)

Working Group 4 on International Reference Atmosphere

Chairman: Dr. W. Priester

a) Region from 30 to 100 km:
rapporteur: Dr. G.V. Groves (UK)
deputy : Dr. G.I. Golyshev (USSR)')

b) Region from 100 to 200 km:
rapporteur: Dr. K.S.W. Champion (USA)
deputy : Prof. S.M. Poloskov (USSR)

c) Region from 200 km and above:
rapporteur: Dr. L. Jacchia (USA)
deputy : Dr. H.K. Paetzold (German Fed.Rep.)

') Dr. Golyshev reserved the right to propose another member of his scientific staff to take his place if necessary.

37. Working Group 1 on Tracking and Telemetry

Chairman: Mrs A.G. Massevitch

a) Revised membership

i) Sub-Group on Optical Tracking

Chairman: Prof. F. Whipple (USA)

Members :

A. Frutkin (USA)
T. Hatanaka (Japan)
H.J. Higgs (Australia)
C. de Jager (Netherlands)
W.M. Kaula (USA)
D.G. King-Hele (UK)
A.G. Massevitch (USSR)
A.A. Mikhailov (USSR)
P. Muller (France)
L. Sehnal (Czechoslovakia)
N.P. Slovokhotova (USSR)
J.D. Zhongolovitch (USSR)

ii) Sub-Group on Radio Tracking and Telemetry

Chairman: Mr. J.A. Ratcliffe (UK)

Members :

P.F. Checcacci (Italy)
L. Cichowicz (Poland)
W. Dieminger (German Fed. Rep.)
A.C.B. Lovell (UK)
A.P. Mitra (India)
R.C. Peavey (USA)
B.G. Pressey (UK)
M.O. Robins (UK)
A.M. Shakhovskoi (USSR)
G.M. Truszynski (USA)
J. Voge (France)

b) Report of meeting of Working Group 1

Working Group 1 met on 30 April, 4 and 7 May. The two sub-groups also met separately on these dates. In attendance at one or more of these meetings were:

Members: Mrs A.G. Massevitch (USSR), Chairman
C. de Jager (Netherlands)
W.M. Kaula (USA)
P.F. Checcacci (Italy)
D.G. King-Hele (UK)
L. Cichowicz (Poland)
P. Muller (France)
A. Frutkin (USA)
B.G. Pressey (UK)
T. Hatanaka (Japan)
J.A. Ratcliffe (UK)

(Attending members, continued)

M.O. Robins (UK)
L. Sehnal (Czechoslovakia
G.M. Truszynski (USA)
F. Whipple (USA)

Observers:

F. Barlier (France)
E. Buchar (Czechoslovakia)
E. Dyer (USA)
E.M. Fournier d'Albe (UNESCO)
L. Jacchia (USA)
M.E. Nason (USA)
A.H. Shapley (USA)
T. Tabanera (Argentina)
W. Zonn (Poland)

Mrs Massevitch reported that since the Florence meeting of COSPAR, one meeting of W.G. 1 was held in Berkeley in August 1961. Problems concerning the distribution of high precision optical tracking stations over the globe and proposed unified codes for communication of ephemerides and tracking data were discussed.

Members of W.G. 1 participated very actively in the preparation of a new version of unified codes for communication of ephemerides and tracking data (see item c (i), page 79).

In accordance with COSPAR resolution no. 7 (Florence), national correspondents for optical and for radio tracking have now been designated by all 18 national institutions represented in COSPAR.

i) World List of Optical Tracking Stations

Dr. Pressey explained the manner in which this List was drawn up. He stated that the final draft had now been prepared and was ready for publication. There were however, two outstanding questions which required decisions by the Working Group before final editing could be done. These were:

a. whether the unified scheme of station code numbering was acceptable;

b. whether a station should have more than one code number.

The unified station code number system was agreed to be acceptable. It was considered that although it was undesirable that a station should have more than one code number all numbers allocated to a station should be shown in the list.

The following resolution was adopted:

RES. 2 Code numbers of Tracking Stations

COSPAR considers that it is undesirable that a tracking station should have more than one code number and recommends that WDC-C who is responsible for the compilation of the World List of Tracking Stations, should request the multiple numbered stations and co-ordinating centers concerned to come to an agreement on the use of a single number. It is also recommended that a number which has once been allocated to a station should not be reallocated to another station even if the original station has ceased to be operational.

ii) Flashing Satellite

Dr. Nancy Roman of NASA reported on the plan to launch in the near future a geodetic satellite. Additional information in pointed form was tabled, containing among other things the main characteristics of the satellite and the conditions which participating stations have to satisfy. During the first week after launching no regular flashes will be given; during the next 3 months the main emphasis should be on calibration of the satellite, thereafter it would be available to observers in all parts of the world. Reduction of the photographs (to apparent right ascension and declination) should be the responsibility of the participating stations.

The following resolution was adopted:

RES. 3 Cooperation in Tracking geodetic flashing satellite

COSPAR expresses its satisfaction at the intention of the USA to launch a geodetic satellite containing a flashing beacon for international use. It recommends that co-operation in tracking should be undertaken by stations having the necessary facilities. It welcomes the undertaking of NASA to supply to participants all information concerning the orbit and instants of flash sequences.

The Working Group agreed to establish a small advisory group consisting of Dr. Whipple (convenor), Mr. Kaula, Mr. Kovalevsky, Mr. King-Hele and Mr. Zhongolovitch. Their terms of reference were to consider:

a) orbits for future satellites;
b) predictions and communications;
c) general problems of analysis and reduction;
d) distribution of observing stations;
e) characteristics of light flashes.

It was agreed that in connection with the observations on the geodetic satellite mentioned above it would probably be necessary to hold a small meeting within the next year to consider the analysis and reduction of photographic data. The following resolution was adopted.

RES. 4 Small meeting of experts on analysis and reduction of photographic data

COSPAR considers it desirable that a small meeting of experts should be held to discuss the analysis and reduction of photographic data and nominates Dr. Whipple as the convenor.

iii) Request from SCAR

In amplification of the request of the Scientific Committee on Antarctic Research, SCAR, for advice on the possibility of using artificial satellites to obtain absolute geodetic positions in Antarctica, Mr. Kaula made the following remarks:

a) Due to the high elevations in Antarctica, such positioning would have to be three-dimensional if it was to be of value;

b) To be observable from all of Antarctica, a 1000 km altitude satellite would have to have an inclination of at least eighty degrees;

c) A satellite of these orbital specifications was also desirable for gravitational studies;

d) Excellent positions, adequate to control medium scale mapping, would be obtained if it were possible to make photographic observations in the Antarctic night;

e) Surveying experience in north Alaska indicates that optical equipment, such as theodolites, could be operated at very low temperatures, but there were problems associated with photographic emulsions, and, in Antarctica, bad weather;

f) If weather compelled the observing to be done in the summer, it is doubtful whether good elevations could be obtained by Doppler radio tracking;

g) It was also of interest to scientific geodesy to obtain a geodetic connection from Antarctica to South America.

Dr. Whipple said that photographic emulsions capable of working at very low temperatures had been developed.

Mr. Kaula was instructed to write a letter to SCAR pointing out the probability of a geodetic satellite of suitable inclination within a few years, and inquiring as to the most southerly latitude required and the possibility of night observations.

iv) Guide for new Stations

In order to give the necessary basic information to institutions which are planning new optical stations, a small committee was formed consisting of Dr. Whipple, Dr. Pressey and Prof. de Jager, for the purpose of drafting the text for such a guide.

Mr. Fournier d'Albe supported this idea and mentioned that UNESCO would be willing to support COSPAR in preparing and publishing such a booklet.

v) Sub-Committee on the rational distribution of high-precision optical tracking stations over the globe

This Sub-Committee was established in accordance with COSPAR resolution No. 8 (Florence) and it consists of C. de Jager (Netherlands, Chairman), W.S. Finsen (South Africa), P. Muller (France) and F.L. Whipple (USA).

The following resolution based on the recommendation of this Sub-Committee and the discussions by W.G.1 was adopted:

RES. 5 Rational distribution of tracking stations over the globe

The Committee on Space Research (COSPAR),

considering that at the meeting of COSPAR in Florence, the following resolution (No. 15) was passed:

"In order to make connections between the various geodetic networks and in order to improve data on the shape of the earth, it is highly desirable that geodetic flashing satellites be launched in the near future and that preparations be made for the establishment of new precision tracking stations in the following very important areas:

N.E. Brazil - E. Mediterranean - N.W. North America - Malay Peninsula - Equatorial Africa - South Pacific."

stresses that

(a) since the list suggested above represents an absolute minimum, it would be of utmost importance to have further high precision optical tracking stations in the following areas:

Central China - North Australia - Western part of North Africa - South West Siberia or Kazakhstan - Central Siberia or Mongolia - North East part of North America - Eastern Europe or European part of Soviet Union,

RES.5 (cont.)

(b) it would be also valuable to have additional high precision optical tracking stations in the following areas:

West equatorial part of South America - Alaska - NE Canada - Extreme South of South America - SE Brasil - Ceylon or S. India - Madagascar - N. Siberia - E. Siberia - S. Greenland - New Zealand

(c) in addition to the above, expeditionary stations may be required to take full advantage of facilities offered by special satellites such as those with flashing lights,

recommends that this resolution be brought to the attention of national scientific institutions adhering to COSPAR, and

notes that advantage can be taken of UNESCO's offer of services to bring this resolution to the attention of national scientific institutions not adhering to COSPAR.

vi) Satellite Designation

Resolution No. 36 (see page 85) of Working Group 3 concerning the designation of satellites was presented by Dr. Shapley. This resolution suggested that the Greek letter designation be replaced by a number. It was agreed to support this resolution.

vii) Other Business

a) At the request of Working Group 3, Dr. Pressey asked for any comment on the practicability of the request contained in paragraph 2.7 of the "COSPAR Guide to Rocket and Satellite Information and Data Exchange" which reads as follows:

"Precise orbits. Precision positional observations, orbital elements, and ephemerides (i.e., tables of subsatellite positions and heights at specific times), which are of great scientific interest and value to research workers in various fields, together with estimates of their accuracy, will be deposited as soon as possible in the WDCs."

It was agreed that this was practicable.

b) Dr. de Jager reported on the decisions of ESRO (European Space Research Organization) concerning the setting up of new tracking stations. Four radio and three optical stations were to be set up but no decisions as to type of instruments or location of sites had yet been made. The locations would not necessarily be in Europe.

c) Sub-Group on Optical Tracking

Resolutions 6-8 were adopted by COSPAR upon recommendation of the Sub-Group on Optical Tracking and Working Group 1.

RES. 6 Optical tracking of short-lived satellites

COSPAR, considering that orbits of short-lived satellites are valuable for determining the properties of the atmosphere in the important 150-250 kilometer zone, recommends the encouragement of optical tracking of short-lived satellites including predictions and the regular reporting of such observations to the IGY World Data Centers.

RES. 7 Classification of telescopes by "tracking power"

COSPAR, considering the need for concise description of fixed camera satellite tracking capability, recommends adoption of classification of telescopes by "tracking power", defined as the stellar magnitude of the satellite plus 2.5 times $\log_{10}$ (angular velocity in degrees per second).

RES. 8 Order of priority of objects for observations

COSPAR recognizes that orbiting satellites are growing too numerous for any one station to observe them all, and resolves that the data-gathering and prediction centres should at appropriate times add to their prediction messages some indication of the order of priority of objects for observations, especially emphasizing the satellites for which recent observations are scarce.

Publication of lists of optical observations

Mr. King-Hele submitted that more observations of short-lived satellites from the USA and the southern hemisphere should be published.

The Working Group recognized the possibility that useful observations may remain unpublished, but felt that no formal recommendation was needed as individual members could look into the situation.

Review of use of tracking stations for general astronomical purposes

Prof. Whipple reported that there is possibly some merit in using the Baker-Nunn cameras for bright comets, but their value has not yet been demonstrated.

Visual moon photometers at 6 SAO stations have been only partially satisfactory for measurement of earth albedo from moon shine as they are too subjective. The sky brightness is inadequately accounted for because the subtraction of the darkside from lightside brightness is logarithmic, not linear. Impersonal photoelectric photometers are being designed and show considerable promise.

The Baker-Nunn cameras have observed some radio stars in order to get optical observations simultaneous with radio emission outbursts. Partial success has been obtained in 150 hours of monitoring. The project is continuing in conjunction with the Jodrell Bank Radio Telescope.

Another possibility is to test seeing.

d) Sub-Group on Radio Tracking and Telemetry

Resolutions 9-14 were adopted by COSPAR upon recommendation of the Sub-Group on Radio Tracking and Telemetry and W.G. 1.

RES. 9 Change in title of Sub-Group on Radio Tracking

The Committee on Space Research (COSPAR),

considering that

a) the title of Working Group 1 is "Tracking and Telemetry",

b) there is a Sub-Group concerned with radio tracking but none concerned with telemetry,

decides, on the recommendation of Working Group 1, that the title of the Sub-Group on Radio Tracking be changed to "Sub-Group on Radio Tracking and Telemetry".

RES. 10 Definition of "space research service" and allocation of separate frequency bands

COSPAR, considering that

a) it is probable that an Extraordinary Administrative Radio Conference of the I.T.U. will be held in 1963 to allocate frequencies for space radio communications and for space research,

b) frequencies assigned to space research will be needed for tracking, command, and telemetry of engineering and technological data, as well as for the main telemetry of scientific results,

c) frequencies assigned to operational communications systems will be needed for tracking, command, and telemetry of engineering and technological data, as well as for the main purpose

of communications,

recommends that

1. a space research service should be defined a space service, or earth-space service providing for the transmission of scientific and technological information acquired by or pertaining to earth satellites or spacecraft. Technological information is defined here as those research and development data required for the development of future scientific satellites and spacecraft. Engineering status information from development or use of operational satellites or spacecraft would not be considered a part of the space research service;

2. frequencies should be assigned to the space research service and to operational communications systems in separate bands.

RES. 11

Allocation of frequencies
for the space research service

COSPAR, considering that

a. at the I.T.U. Conference held in Geneva in 1959 COSPAR presented in outline a list of the frequencies required for space research;

b. the U.S.A. has proposed and circulated a document entitled "Preliminary Views on Frequencies required for Space Research";

recommends that an allocation of frequencies similar to that in the "Preliminary Views", but with the addition of a telemetry band 401-402 Mc/s is necessary and sufficient for the space research service.

RES. 12

Allocation of frequencies
on a world-wide exclusive basis

COSPAR, considering that the techniques of space science are developing so rapidly and the requirements for telemetry are so stringent,

recommends that allocation of frequencies for space science should be made on a world-wide exclusive basis.

RES. 13 Definition of Radio Tracking Station

The Committee on Space Research (COSPAR),

considering that

In accordance with COSPAR Resolution 6 of the Florence meeting it was resolved that a world list of radio tracking stations should be compiled and that the preparation of such a list would be facilitated if there was a definition of a Radio Tracking Station,

recommends that

A Radio Tracking Station should be defined to be a radio station which has facilities for providing either positional or directional data for the purpose of obtaining orbital information about scientific earth satellites or information about the track of other scientific space vehicles, and which operates on a reasonably regular programme for such purposes.

RES. 14 Standardizing of frequencies in telemetry systems

COSPAR, considering

(a) that it is often advantageous to receive the telemetry from satellites at several different ground stations, not necessarily belonging to the same organization, but

(b) that there is less advantage at present to be gained in standardizing the detailed carrier modulation systems,

recommends

that all who design telemetry systems should endeavor to standardize the frequencies on which they work, and the arrangements required for recording the transmissions, but not necessarily the detailed carrier modulation systems.

Radio Amateurs

It was pointed out at the Plenary meeting of COSPAR that radio amateurs, especially those in remote locations could perhaps help to pick up telemetry.

38. Working Group 2 for the IQSY

(formerly Working Group on "Scientific Experiments")

a) Changes in Working Group 2

i) New Chairman

COSPAR accepted with regret the resignation of Professor J. Bartels, Chairman of W.G. 2 (See "Votes of Thanks", section 15, page 24-25) and appointed Dr. H. Friedman Chairman of this Working Group.

ii) Change in title of Working Group 2

The Executive Council considered that for several years to come international coordination of geophysical experiments would likely be classified according to the IQSY categories.

The appointment of correspondents for five disciplines in COSPAR W.G. 2 at the Florence meeting had already anticipated this. The Executive Council felt that COSPAR should now adapt the title of Working Group 2. Resolution 15 which follows was unanimously adopted by COSPAR.

RES. 15 COSPAR Working Group for the IQSY

The Committee on Space Research (COSPAR), considering the importance of space research in the forthcoming IQSY, and contemplating that separate Working Groups may be established for subjects such as space biology, lunar and planetary studies, space experiments having potentially undesirable effects on other scientific studies, etc.,

decides, on the recommendation of the Executive Council, that the existing title of Working Group 2 (Scientific Experiments) be discontinued and that it be replaced by the title "COSPAR Working Group for the IQSY". This new Working Group is to consist of the same members as the old Working Group 2 except for Prof. M. Florkin and Prof. J. Lederberg. It will also include the present Panels on "Synoptic Rocket Soundings" and "Polar Cap Experiments".

It is contemplated that this new Working Group will consider all phases of space research associated with the IQSY and WMS, and in addition will give attention to preliminary plans for space research during the next period of maximum solar activity.

b) Revised membership

Chairman: Dr. H. Friedman

Correspondent for:

Aeronomy and Aurora	: S.M. Poloskov (USSR)
Ionosphere	: W.J.G. Beynon (UK)
Meteorology	: H. Wexler (USA)
Geomagnetism and Cosmic Rays	: J.D. Kalinin (USSR)
Solar Activity and the Interplanetary Medium	: H. Friedman (USA)

Members:
P. Alexander (UK)
J. Blamont (France)
J. Bartels (German Fed. Rep.)
S.A. Bowhill (USA)
R.L.F. Boyd (UK)
J. Chamberlain (USA)
J.H. Chapman (Canada)
A. Ehmert (German Fed. Rep.)
R. Frith (UK)
L. Goldberg (USA)
K.I. Gringauz (USSR)
F. Hoyle (UK)
R. Jastrow (USA)
J. Kaplan (USA)
L.V. Kurnosova (USSR)
B. Landmark (Norway)
R. Lüst (German Fed. Rep.)
R.A. Lyttleton (UK)
K. Maeda (Japan)
D.F. Martyn (Australia)
R. Michard (France)
H.E. Newell (USA)
M. Nicolet (Belgium)
G. Pfotzer (German Fed. Rep.)
J.G. Roederer (Argentina)
D.C. Rose (Canada)
V.A. Sarabhai (India)
G.V. Schvitkovsky (USSR)
J.M. Stagg (UK)
G.W. Swenson (USA)
S.N. Vernov (USSR)
Z. Shvestka (Czechoslovakia)

Panel on Synoptic Rocket Soundings

Chairman: Prof. J. Blamont (France)

Panel for Polar Cap Experiments

Chairman: Dr. B. Landmark (Norway)

c) Report of meeting of Working Group 2

Working Group 2 met on 30 April and 4 May 1962. In attendance at one or both meetings were:

Members:

J. Bartels (G.F.R., Chairman)
W.J.G. Beynon (UK)
J. Blamont (France)
R.L.F. Boyd (UK)
J.H. Chapman (Canada)
A. Ehmert (G.F.R.)
H. Friedman (USA)
R. Frith (UK)
R. Jastrow (USA)
J.D. Kalinin (USSR)
R. Lüst (G.F.R.)
K. Maeda (Japan)
J.E. Naugle (for H.E.Newell,USA)
G. Pfotzer (G.F.R.)
J.G. Roederer (Argentina)
D.C. Rose (Canada)
V.A. Sarabhai (India)
J.M. Stagg (UK)
G.W. Swenson (USA)
S.N. Vernov (USSR)
H. Wexler (USA)

Guests:

K. Hirao (Japan)
E. Levinthal (USA)
J. Ortner (Sweden)
J.C. Pecker (France)

Prof. Bartels mentioned that the task of Working Group 2 was to review recommendations for scientific experiments in space, to discuss and to try to coordinate such experiments. He recalled that at the COSPAR meeting in Florence, five correspondents were appointed for special topics in analogy to the structure of the former Special Committee for the IGY (CSAGI). It was felt that a certain division of tasks was desirable within the Working Group and that the work in different fields should be activated by the experts in these fields.

He reported that since the COSPAR meeting held in Florence, one informal meeting of Working Group 2 was held in Kyoto on 9 September 1961 on the occasion of the "Symposium on Earth Storms". Dr. K. Maeda acted as convenor of W.G. 2 and 21 scientists from 9 countries attended the meeting. The resolutions of W.G. 2 adopted at the COSPAR meeting in Florence were reviewed and comments or further recommendations were made on specific experiments and projects that would benefit from international collaboration with special reference to the Earth Storms Symposium.

i) Review of recommendations made at an informal meeting of W.G. 2 in Kyoto, September 1961

Dr. K. Maeda reported on specific suggestions of radio and other experiments on the upper atmosphere which were proposed and discussed at this informal meeting. These suggestions were reviewed and after some revisions, recommendations were made as follows:

- Radio propagation study at VLF

COSPAR recognizes the importance of an experiment, such as U.S. LOFTI-1, in which a receiver borne in a satellite measures the field intensity of VLF waves emitted from a transmitter on the ground. The main purpose of such an experiment is to study radio propagation characteristics of VLF waves through the ionosphere. It is recommended that the receiving system to be borne in a satellite should be designed and arranged so that it can measure as many waves as possible by utilizing the existing VLF transmitting stations in various parts of the world, and that the receiver measure radio noise intensity when the satellite is in a position too far from a specific transmitting station to detect its wave.

- Study of whistlers and VLF emissions

COSPAR regards the experiment with Vanguard III satellite which included the reception of whistlers, as of great importance and recommends that in such occasion the reception of the VLF emissions, such as hiss and dawn chorus, should be planned and that for this purpose a special consideration be made on setting the satellite orbit. In addition a good global network of ground stations to take simultaneous records will be very important.

- Detection of field aligned ionization irregularities

It is important to carry out satellite experiments to confirm the existence of field aligned ionization irregularities by means of probe method. In such occasion the following ground observations should be made simultaneously:

(i) Experiment on radio wave reflection from field aligned ionization irregularities at VHF.
(ii) Observation of long delay echoes at VHF.
(iii) Reception of whistlers and VLF emissions.

- Special experiments on geomagnetic micropulsation

It is quite desirable to devise such apparatus that can measure polarization of geomagnetic micropulsation and density variation if possible.

- Temperature and wind velocity measurements

COSPAR recognizes the importance of temperature and wind velocity measurements with rockets from the viewpoint of ionosphere dynamics as well as meteorological aspect. An infra-sonic duct, which is formed by temperature structure in the height covering D and E layers, is able to guide certain ionospheric as well as atmospheric disturbances. It is urged that the experiment should be continued and extended in order to know the world-wide distribution of temperature and wind velocity and their diurnal and seasonal variations.

ii) Review of recommendations made for the IQSY

Prof. Bartels reported on the IQSY meeting held in Paris at the end of March 1962. He described the working groups which

were set up in various disciplines and explained that a special group on Space Research had been established to discuss the suggestions for space experiments put forward by the discipline working groups. A report of the recommendations of this special group on Space Research was prepared by Prof. Bartels and is given in full in Appendix C, page 97 of this report.

Members of the Working Group discussed the different items in this report and made comments and additional recommendations as follows:

- Implication of Space Research to the Meteorological Programme of IQSY

Dr. Wexler referred to a suggestion to map the aurora by using satellites. This is presently under study by NASA.

- Geomagnetism

With reference to item 24 of Prof. Bartels' report concerning continuous telemetry, Dr. Sarabhai suggested that a few fundamental parameters of the atmosphere should be continuously transmitted. Dr. Friedman supported this suggestion and emphasized the need for it. Further discussion led to resolution No. 16 (page 67) which was adopted by COSPAR.

- Aurora

Dr. Friedman pointed to the need for standardizing the auroral flux. Definition of a fundamental quantity is highly desirable.

- Ionosphere

Dr. Rose invited interested groups to request data from the Canadian satellite Topside Sounder. Dr. Chapman reported that topside sounding ionograms would be deposited in the World Data Center A for the ionosphere.

- Solar Activity

Prof. Bartels referred to his suggestion supported by C.W. Allen that the solar constants should be measured very accurately. After some discussion on the meaning of this "constant", Prof. Bartels emphasized again that absolute photometry indeed should be recommended. Dr. Naugle commented that no such solar satellite is available at present. Dr. Friedman asked Prof. Poloskov about the plans of the USSR for measuring solar emissions. Prof. Poloskov replied that there was nothing in progress as yet but that something will be done.

Dr. Friedman commented on a proposal of Dr. Mustel to measure coronal qualities making use of the eclipsing of radio stars by the solar corona. By this method coronal measurements could be extended from 10 to 100 solar radii. Dr. Lüst proposed to determine the temperature conditions of the external corona. This quality enters all theoretical considerations, but is not known to any satisfactory extent.

Dr. Friedman emphasized that further rocket observations of solar X-Rays should be encouraged.

- Cosmic Rays

A lengthy discussion arose about Dr. Roederer's suggestion to inject ions in the magnetosphere to determine conjugate points. Dr. Roederer suggested that COSPAR should charge a group to find out how the injection could be achieved. This led to the formation of a Preparatory Group to study the experimental approaches to this problem (see resolution no. 17, page 68).

Dr. Naugle suggested simultaneous measurements of Cosmic Rays. Dr. Ehmert proposed to extend these measurements to energy spectra at low energies. This led to Resolution No. 18 (see page 68) which was adopted by COSPAR.

- Aeronomy

Prof. Nicolet emphasized that the requirements for the study of each component of the atmosphere are different. Small rocket measurements are recommended.

iii) Probes through Comets

Dr. B.D. Donn reported for Prof. R.A. Lyttleton and commented on the suggestion of "probes through comets". He pointed out to the fact that a sufficient number of periodic comets approach near enough to the earth to be studied by space probes. This suggestion was supported and led to the establishment of a Preparatory Group to make a more detailed study of the subject (see resolution No. 19, page 68).

iv) Utilization of Ionosphere Beacon Satellites

Dr. G.W. Swenson Jr. gave a verbal summary of his recommendation on the utilization of Ionosphere Beacon Satellites. He pointed out the applications to ionospheric research of beacon transmitters in earth satellites and explained the need for world-wide cooperation in measuring the Faraday- and Doppler-effect of radio waves which (as was shown in the past) is a very suitable method for the determination of the atmospheric electron content. This method can be essentially improved by choosing well adapted frequencies of the Beacon which are not modulated. The costs for one individual receiving station were estimated at $3500 - $4000.

Prof. Beynon strongly supported this proposal which will be directed to the attention of national committees. This proposal led to Resolution No. 20, page 68, which was adopted by COSPAR.

Dr. Porter pointed to the USA annual report to COSPAR where it is mentioned under the section "future program" that a seven-frequency ionosphere beacon will be placed in a polar orbit for world-wide ionospheric research and that international cooperation in the use of this satellite is invited.

v) Panels on "Synoptic Rocket Soundings" and for "Polar Cap Experiments"

The reports and resolutions relating to the Panel on Synoptic Rocket Soundings and to the Panel for Polar Cap Experiments are given in separate sections on pages 69-73 and 73-77 respectively.

d) Resolutions adopted by COSPAR upon recommendation by Working Group 2

RES. 16 Telemetry on Real Time

COSPAR recommends that satellites be instrumented to measure various basic geophysical parameters and to transmit such data in real time for reception by ground based observatories. These data would permit scientists in various countries to extract information of particular significance to their work, without delay and in the form in which they require. Examples of such fundamental data are:

(a) Solar activity studied by UV and X-Ray detectors.
(b) Geomagnetic activity measured by magnetometers.
(c) Auroral activity measured through auroral emissions.
(d) Particle radiations of E > 100 Mev for protons.
(e) Trapped radiations.
(f) Infrared emissions from the atmosphere.

It is believed that such real time telemetry can be provided with a relatively low power drain compared to the consumption by major missions of the satellites. Experience with continuous telemetry from satellites has shown that relatively simple ground based systems can be used for the acquisition of highly significant experimental data. This approach extends the benefits of satellite techniques directly to the great majority of countries unable to commit adequate resources to their own satellite programs. This calls for action by National Committees of countries which have capabilities of orbiting instrumented satellites and by National Committees of countries which are interested in receiving the data by establishing ground stations.

RES. 17 Determination of Conjugate Points of Geomagnetic Field Lines

COSPAR establishes a "Preparatory Group on Determination of Conjugate Points of Geomagnetic Field Lines" to investigate experimental approaches to this problem (by injection of ions, radio methods, whistlers, etc.). This preparatory group consists of J.G. Roederer (Argentina, Chairman), R. Helliwell (USA), W.N. Hess (USA), J. Paton (UK) and E.H. Vestine (USA).

RES. 18 Addition to CIG-IQSY Resolution on Cosmic Rays (March 1962, Paris)

COSPAR recommends that the following be added to the resolution of the IQSY Working Group on "Cosmic Rays":

"Special measurements should be made of the energy distribution and the mass distribution especially in the low energy range and outside the earth's magnetosphere. Also a search on anisotropies of cosmic rays outside the magnetosphere and on their energy dependence should be carried out".

RES. 19 Probes through Comets

COSPAR establishes a "Preparatory Group on Probes through Comets" to discuss the suggestion that Comets be studied by Space Probes. This Preparatory Group consists of R.A. Lyttleton (UK, Convenor), L. Biermann (German Fed. Rep.), B.D. Donn (USA), P. Swings (Belgium), F.L. Whipple (USA) and one or two USSR representatives to be designated.

RES. 20 Beacon-type Satellites

COSPAR calls the attention of satellite launching organizations to the need for regular launchings of ionosphere beacon-type satellites especially during IQSY and recommends that observations of signals from such satellites be made on the widest possible geographical basis.

COSPAR calls the attention of the URSI-CIG Committee to this resolution and invites the Committee to consider ways and means for the general coordination of a program of observations including the alerting of participants, the supply of orbital data, standardization of measurement techniques and the interchange of the results obtained.

e) Panel on Synoptic Rocket Soundings

Members: J. Blamont (Chairman) (France)
D.R. Bates (UK)
S.A. Bowhill (USA)
R.L.F. Boyd (UK)
M. Dubin (USA)
H. Friedman (USA)
L. Harang (Norway)
W. Heikkila (Canada)
C.O. Hines (Canada)
W.W. Kellogg (USA)
K. Maeda (Japan)
M. Nicolet (Belgium)
S.M. Poloskov (USSR)
G. Righini (Italy)

Prof. Blamont, Chairman of this Panel, presented to the members of W.G. 2 a verbal report on the meeting of the Panel which was held on 3 May.

He gave a summary of the subjects covered by the Panel and reported that recommendations had been prepared on three main topics as follows:

i) Meteorological Sounding network (Dr. H. Wexler)
ii) Experiments with Sodium clouds (Prof. J. Blamont)
iii) Dynamics of the lower ionosphere studied by experiments with sounding rockets (Dr. S.A. Bowhill)

The correspondents (named above) for these three topics presented their recommendations to the meeting of W.G. 2.

Following Dr. Blamont's report, mebers of W.G. 2 discussed briefly whether the status of this Panel is adequate. It was felt that programs of the Panel should not be based only on individuals but should clearly be accepted by national committees. Prof. Blamont emphasized however that in planning the work of the Panel he tried to coordinate groups which were already active and accepted in the sense mentioned above. He added that the work on the Panel's program has started in a most promising way.

Resolutions adopted by COSPAR upon recommendation by the Panel on Synoptic Rocket Soundings and Working Group 2

RES. 21 Meteorological Rocketsondes

COSPAR, recognizing the valuable and unexpected results that have emerged from the present sporadic and localized launchings of meteorological rocketsondes, strongly urges an increase in the number of stations from the present or proposed 20-25 to at least 50, so that reasonably complete maps can be drawn of the wind and temperature patterns in the Northern Hemisphere. Launches should be scheduled in accordance with the program for aerological observations recommended by the CIG, to the extent that rockets and facilities are available.

To stimulate growth of the rocketsonde network and to insure coordination of launch schedules and exchange of data, it is proposed that Dr. H. Wexler, Meteorological Correspondent of W.G. 2, working in close cooperation with Dr. J. Blamont, Chairman of the Panel on Synoptic Rocket Soundings, contact the key individuals in each of the countries involved in rocket sondes. Names of such persons should be furnished by the National Committees to Dr. H. Wexler, U.S. Weather Bureau, Washington 25, D.C., U.S.A., as soon as possible.

RES. 22 Dynamics - Rocket measurements of winds

COSPAR recommends that a series of simultaneous rocket measurements of winds in the lower ionosphere (up to about 200 km) be organized on, or during periods of 3 days starting 25 October 1962 and 24 February 1963.

The techniques employed should include grenades, sodium clouds and visible grenade glows.

COSPAR also recommends that simultaneous ground-based measurements by radio methods also be made on the above dates.

COSPAR further recommends that a similar series of simultaneous rocket and ground-based wind measurements should be organized at approximately 6-month intervals during IQSY. The precise dates for this work shall be determined in consultation with the IQSY correspondent for the International World Day Service.

RES. 23 Sunspot Minimum Ionospheric Rocket Sounding Program

COSPAR endorses the following proposal for a Sunspot Minimum Ionospheric Rocket Sounding Program.

"An understanding of the physical processes in the D and E regions of the ionosphere, the relation between cause and effect, can at present best be obtained by rocket experiments.

With the approach of the International Year of the Quiet Sun in 1964-65, an opportunity will occur to obtain, for the first time, synoptic properties of the quiet ionosphere. To quote from the finds of the CIG at their meeting in Paris in January 1961: "Full advantage shall be taken (in the IQSY) of the new knowledge of solar-terrestrial relationships gained during the IGY and also of the improved and new techniques for geophysical research which have been, and will be, developed in the intervening years."

It is proposed that a cooperative set of rocket experiments should be undertaken internationally during the IQSY, planned in a way which will give a maximum of scientifically useful information, ensured by coordination of effort by the various interested groups. The concept of this experiment has been endorsed by CIG at its first IQSY meeting in Paris in March 1962.

The detailed proposal is as follows:

1. The observations should cover a height range of 60 to 160 km. This range can be attained by various types of small rockets.

2. Useful locations for launch sites for study of this height region include auroral latitude, medium latitude in each hemisphere, and magnetic equatorial stations.

3. Because it is necessary to measure electron density simultaneously with other critical parameters of the atmosphere in the same rocket, the desirable measurements have been arranged in an order of priority. This order represents increasing order of complexity of the experiments, and does not necessarily correspond to the order of scientific desirability. While a complete experiment would comprise all experiments (a) to (i), useful information could be obtained using a smaller number.

(a) Lyman-alpha photometer, for molecular oxygen densities at 70-80 km height;

(b) Ultraviolet photometer at 1425-1480 Å for molecular oxygen densities at 100-120 km height;

RES.23 (cont.)

(c) Either an r.f. resonance probe or an ion trap, for E region electron and ion densities, respectively;

(d) Langmuir probe or r.f. impedance probe for electron density in the D and E regions;

(e) Magnetometer for current sheet measurements in the E region;

(f) Reverse Seddon-Jackson dispersion experiment, possibly including differential mode absorption, for D and E region electron densities;

(g) Medium frequency radio absorption, for D region electron densities;

(h) X-ray photometer in the 44-60 Å band for air densities at 100-120 km height;

(i) R.F. mass spectrometer for E region ion composition.

4. It is essential that any rocket measurements should be accompanied by simultaneous measurements of ionospheric parameters near the launch point. Minimum measurements include:

a. vertical incidence ionosphere sounder;
b. cosmic noise riometer;
c. sky photometer (for auroral stations only);
d. partial reflection technique for D region soundings.

It might also prove desirable to have a magnetometer at each station.

5. Concerning the frequency of the observations, it is noted that the IQSY has eight quarters. To coordinate observations as far as possible, one day should be assigned in each quarter for simultaneous observations, to be called the Synoptic Rocket Day (SRD). While various stations may have different numbers of rockets available on any particular SRD, six significant times of day (local time) have been identified as follows:

1. 30 min before sunrise at 120 km level;
2. half-way between sunrise at 120 km level and ground sunrise;
3. 30 min after ground sunrise;
4. noon;
5. half-way between sunset at ground level and sunset at 120 km level;
6. 30 min after sunset at 120 km level.

A complete program at four stations would involve a total of 192 rocket launchings.

RES.23 (cont.) 6. Because the behavior of the D and E layers depends primarily on latitude and local time, launch programs should be coordinated between groups to give best coverage of the entire IQSY. "

COSPAR suggests that the National Committees should, to the extent appropriate to each country, form their detailed plans for the IQSY, within the framework of this proposal.

COSPAR also requests that the Panel on Synoptic Rocket Soundings review the progress and report periodically on the implementation of this proposal.

f) Panel for Polar Cap Experiments

Dr. D.C. Rose, Chairman of this Panel, presented to Working Group 2 the following report of the meeting of the Panel held on 2 May.

Report of Meeting of Panel for Polar Cap Experiments

The Panel met on 2 May. In attendance were:

D.C. Rose (Canada) (Chairman)
S.A. Bowhill (USA)
R.L.F. Boyd (UK)
J.H. Chapman (Canada)
W.J. Heikkila (Canada)
B. Landmark (Norway)
J. Ortner (Sweden)
G. Pfotzer (German Fed. Rep.)

i) Actions of the Committee since Florence meeting, April 1961

An exchange of correspondence was carried out early in 1962 by members of the Panel. A suggestion was made that an effective way to start objective action would be to have one of the Panel members visit the various countries bordering on the northern polar region and taking an active interest in polar cap absorption phenomena.

The President of COSPAR agreed to such a plan and Dr. J. Ortner was selected and agreed to visit the various countries concerned and prepare a report outlining both ground support and rocket launching facilities which might be used for cooperative experiments on PCA's.

Dr. Ortner visited North American and European countries but because of the short time available for arrangements it was not possible for him to visit the USSR. It is hoped that he can

complete his survey by a later visit to the Soviet Union or that the information such as is summarized in his report can be prepared for the Panel by Soviet scientists.

ii) Dr. Ortner's report

Dr. Ortner gave a verbal summary of the report which he prepared. This report will be distributed within the next months. The part concerning the activities in the U.S.S.R. will appear as an appendix to this report as soon as it is possible to complete this information.

iii) Recommendations

A very profitable discussion was held on many subjects relating to polar cap absorption. The results of this discussion are summarized in Resolutions 24 to 29, pages 76-77.

iv) Future activities and scope of the Panel

It was noted that the Committee is still only on an ad-hoc basis and it was recommended that the Panel now be established on a long term basis with some change in its membership and less confined terms of reference. Since all forms of absorption in the lower ionosphere are closely related, the Panel should be free to study and make recommendations on all phenomena related to the lower ionosphere in polar regions. With such open terms of reference the Committee should continue as a Panel of Working Group 2.

v) Proposed membership of the Panel

B. Landmark (Norway), Chairman
J. Ortner (Sweden), Secretary

W.J. Heikkila (Canada)
A. Lebeau (France)
C.G. Little (USA)
K.W. Ogilvie (USA)
W. Pfister (USA)
G. Pfotzer (German Fed. Rep.)
S.M. Poloskov (USSR)
J.G. Roederer (Argentina)
J. Rybner (Denmark)
A.P. Willmore (UK)
J.R. Winckler (USA)

Another member to be designated from Canada
Another member to be designated from the USSR

vi) Symposium on experimental aspects for rocket investigation

A proposed action for the new Panel is to take part in, or perhaps organize, a small symposium on experimental aspects for rocket investigation. This might be done jointly with the European Preparatory Commission for Space Research (COPERS) or other interested group.

vii) The IQSY

The Committee discussed the plans for the International Year of the Quiet Sun. While PCA events may be rare during the next few years the Committee considered that cooperative experiments during that period were of considerable importance particularly experiments of a synoptic nature to complete our knowledge of the lower ionosphere under undisturbed conditions.

viii) Relationship with other Panels

The Committee realized that some of the above program suggestions may overlap the interest of other panels such as the Panel on Synoptic Rocket Soundings. It was felt that a detailed delineation of terms of reference or scope is not desirable and that common interests in the various panels can best be served by exchange of information on activities and by inviting the chairmen of the panels to attend each others meetings.

Discussion of the Panel's report by Working Group 2

Working Group 2 accepted the report and recommendations of the Panel. It was agreed that the work of this Committee should be established on a long term basis (See Res. 24, page 76) and that the Committee should continue as a Panel of W.G. 2. The new membership of the Panel as recommended in the report was approved.

Prof. Kalinin was asked for some information on the attitude of the USSR concerning the PCA experiments. He said that he could not give it in a concrete manner. He referred however to the opinion of Prof. Pushkov, according to which PCA experiments should in fact be a subject for URSI and not for COSPAR.

After some discussion on this point, Prof. Beynon supported the opinion that Polar Cap events should also be a subject for COSPAR as well as for URSI, because the methods are not restricted to the measurement of radio-wave absorption. This should however be reflected also in the title of the Panel and it was agreed that the new title shall be: "Panel for Polar Cap Experiments" (see Resolution 24, page 76).

Dr. Roederer emphasized that not only the northern polar region was to be taken into consideration and suggested that the Panel should also cover the countries bordering the antarctic region (see Resolution 30, page 77).

In the Plenary meeting of COSPAR, Dr. Roederer also suggested that COSPAR should get in touch with SCAR concerning this matter and that a visit to countries bordering the antarctic region such as was undertaken by Dr. Ortner would be very useful. It was agreed to leave this question to the Bureau of COSPAR.

Finally, Prof. Bartels announced that Dr. D.C. Rose wished to retire as Chairman of the Panel. On behalf of Working Group 2 he thanked Dr. Rose for his initiative in guiding the work of this very active committee. Dr. B. Landmark was appointed new Chairman of the Panel.

Resolutions adopted by COSPAR upon recommendation by the Panel for Polar Cap Experiments and Working Group 2

RES. 24 Change in title of Panel

COSPAR agreed on the recommendation of Working Group 2 to establish the ad-hoc Committee on Polar Cap Absorption Experiments on a long term basis and to give this Committee the new title of "Panel for Polar Cap Experiments".

RES. 25 Report on ground and rocket experimental facilities for Polar Cap Absorption Experiments

COSPAR recommends that, if possible, arrangements should be made for Dr. Ortner to visit the USSR to complete his informative report so that information on all ground and rocket experimental facilities in regions around the north polar area will be available to COSPAR.

RES. 26 Communication channel between rocket launching facilities at Churchill and Kiruna

COSPAR notes with considerable pleasure the proposed rocket launching facility to be built at Kiruna by the European Space Research Organization. The great advances in scientific knowledge about the lower ionosphere that will be made possible by cooperative experiments carried out at Churchill and Kiruna are so very apparent that detailed comment is not necessary here. One objective that would be an effective and very desirable stimulus to joint experiments would be a full time communication channel between Churchill and Kiruna. COSPAR recommends that the countries concerned should investigate the best way of establishing such a link.

RES. 27 Balloon Experiment over Arctic Regions

COSPAR notes:

a) a proposal by Dr. J.R. Winckler of the University of Minnesota for a comprehensive balloon experiment over Arctic Regions;

b) that this experiment would be of particular value to Polar Cap experiments;

and recommends international support for this proposed experiment.

RES. 28 International cooperation in balloon launched experiments

COSPAR notes with pleasure the extent to which international cooperation is taking place in balloon launched experiments particularly by American and European scientists, some of the results of which have been presented at this meeting of COSPAR.

COSPAR recommends continued cooperation in this field.

RES. 29 Exchange of payloads in rocket experiments.

COSPAR, considering that probably more exchanges of payloads in rocket experiments will be done with the growth of rocket launching facilities, emphasizes the value of these exchanges in all countries concerned with PCA experiments and recommends that such exchanges be done.

RES. 30 Desirability of Experiments on polar events in South Polar Regions

The Committee on Space Research (COSPAR),

considers that it is important that a comparison of absolute measurements in South polar as well as North polar regions be made with particular reference to phenomena related to radiation belts in which significant differences between the two regions may be expected;

notes that the coverage of the South polar region is very difficult in relation to that of the North;

recommends that all countries at high southern latitudes be urged to make every effort to perform experiments on polar events with sounding rocket balloons and ground experiments. These experiments should be coordinated through the Panel for Polar Cap Experiments and the information about facilities in Dr. Ortner's report should be expanded to include facilities in the South polar region.

39. Working Group 3 on Data and Publications

Chairman: Prof. A.P. Mitra

a) Revised membership

Chairman: Prof. A.P. Mitra

Correspondent for:

SPACEWARN	Dr. A.H. Shapley (USA)
Data Interchange and World Data Centers	Dr. H. Odishaw (USA)
COSPAR Publications	Dr. B.G. Pressey (UK)

Members: Dr. Y. Aono (Japan)
Mr. K.D. Boggs (USA)
Mr. E.C. Buckley (USA)
Dr. T. Nazarova (USSR)
Dr. J. Rösch (France)
Dr. M.J. Stoller (USA)

b) Report of meeting of Working Group 3

Working Group 3 had four full sessions on 30 April, 4, 7 and 8 May. In addition, a special sub-committee consisting of the representatives of the three World Data Centers met on two occasions and an informal meeting of the National SPACEWARN contacts was held on 2 May under the chairmanship of Dr. Shapley. In attendance at one or more of the meetings of W.G. 3 were:

Members:
A.P. Mitra (India) Chairman
T. Hatanaka (for Y. Aono, Japan)
K.D. Boggs (USA)
N.R. Brockett (for E.C. Buckley, USA)
G.I. Golyshev (for T. Nazarova, USSR)
H. Odishaw (USA)
B.G. Pressey (UK)
J. Rösch (France)
A.H. Shapley (USA)

Invited observers:

P.J. Beaulieu (COSPAR Secretariat)
M. Burton (IUPAC)
E.M. Fournier d'Albe (UNESCO)
A.N. Izvekov (USSR)
C. de Jager (Netherlands)
J. Virginia Lincoln (USA)
A.F. Moore (UK)
M.E. Nason (USA)
J.C. Truesdale (USA)

Prof. Mitra reported that much of the work of W.G. 3 since the Florence meeting of COSPAR had been done by correspondence. He mentioned some contacts he has had with the correspondents for SPACEWARN and for Data Interchange.

He then called on the correspondents of W.G. 3 to present their reports.

c) Report by SPACEWARN Correspondent, A.H. Shapley

Dr. Shapley reported on the revision and unification of synoptic codes and presented a report on activities of the SPACEWARN network in 1961 (see Appendix D, page 105). The discussions which followed are reported below.

i) Unified Synoptic Codes

The Booklet on Unified Synoptic Codes, prepared by Mr. Shapley in association with members of W.G. 1 and 3 was presented and discussed. Certain minor changes in the booklet were suggested during the course of the meeting, in particular providing for use of the metric system. The Working Group recommended that this booklet should be published along with the revised WDC Guide at an early date (see item iv, page 83). The Working Group considered the Booklet on Unified Codes to be a very valuable one and recommended the use of these codes by space science laboratories, tracking stations and computing centers, wherever appropriate (see Resolution 31, page 84).

ii) Regional Broadcasts of Satellite Information

The Working Group noted with satisfaction that regional broadcasts of satellite information have been instituted from Japan from July 10, 1961; from USA from September 4, 1961; and from France. The Working Group has been informed that broadcasts of satellite launchings are also made in the USSR. The Working Group recommended that any changes in the broadcast schedule, content and radio frequencies of these transmissions should be communicated to the COSPAR Secretariat and the SPACEWARN Correspondent immediately (see Resolution 32, page 84).

iii) Cooperation with WMO concerning the use of the worldwide communication network which WMO coordinates

Mr. Shapley reported that, in accordance with Resolution 24 adopted by COSPAR in Florence, there had been an exchange of correspondence with WMO concerning the possibility of making use of the worldwide communication network which WMO coordinates for processing meteorological data, for the distribution of satellite information of general interest and applicability. This correspondence led to the following recommendation drafted by the WMO Commission for Synoptic Meteorology, Washington, D.C., March 1962, but which will not become final until confirmation by the WMO Executive Committee in late May:

"10.1 Transmissions of non-meteorological messages on WMO channels

The Commission studied the request of COSPAR regarding the dissemination on meteorological telecommunication channels of satellite movement information. It was noted that COSPAR already has made arrangements for dissemination of such data to certain recipients and that the suggested dissemination on meteorological telecommunication channels would be supplementary to this. The Commission was concerned over the possible implications of passing non-meteorological messages over meteorological channels and in view of the permanent nature and expected gradual increase in the volume of satellite movement information to be disseminated, the Commission felt unable to recommend at this stage the inclusion of these data in the already overloaded inter-regional exchange schedules. However, in view of the desire of WMO to support space research activities, Regional Associations or Members of WMO may wish to study the feasibility of disseminating these COSPAR messages within their Regions or within the countries concerned."

The Working Group recommended that Satellite Regional Warning Centers (SRWCs) and National SPACEWARN Contacts explore the possibility of cooperation on a regional and national scale (see Resolution 33, page 84).

iv) Utility and Effectiveness of the SPACEWARN System

The Working Group felt that the SPACEWARN system has been at least moderately effective, and will gradually improve with the appointment of the remaining SPACEWARN Contacts and as new avenues are explored. The Working Group requested further reports from SRWC and National SPACEWARN Contacts for the next meeting of COSPAR (see Resolution 34, page 85). In this connection, the following summary provisional information has been made available.

(a) During 1961 the SRWCs distributed to each other about 12 launching announcements, 525 orbital element predictions in SATOR code, about 600 messages with tracking observations and numerous miscellaneous messages. The rate of activity has continued to increase during the first months of 1962.

(b) The SRWC activity in their respective regions is indicated by the following summary of addresses directly served by SRWC:

Darmstadt	19 addresses in 7 countries
Kokubunji	4 addresses in 3 countries
AGIWARN	about 23 addresses in 12 countries
Moscow	addresses in 7 countries

d) Report by Correspondent for Data Interchange and W.D.C.s, H. Odishaw

i) Revision of WDC Guide to Rocket and Satellite information and data interchange

The Revised WDC Guide compiled by Dr. H. Odishaw and his colleagues, along with changes incorporated in accordance with comments received, was presented and studied. The Working Group made some minor changes in the Guide and recommended that it be adopted by COSPAR and published at an early date (see item iv, page 83 , and Resolution 35, page 85).

ii) Nomenclature for Satellite Designation

The Working Group was in favor of the suggested change in the scheme for designating satellites for communication codes, for data interchange and for the scientific literature. The suggestion emerged informally from a meeting of COSPAR participants held in Berkeley in August 1961 and would provide that, beginning with launchings in 1963, satellites be identified by the year of launch and a serial number, with individual components or objects designated by capital letters. The Working Group coordinated this matter with Working Group 1 and Resolution 36, page 85 , was adopted by COSPAR.

iii) Cumulative catalogues

Cumulative catalogues for the period Jan. 1960 to Dec. 1961 have been prepared, in accordance with Florence Resolution No. 30, by WDC-A and WDC-C. While WDC-B has not issued any single catalogue for the entire period, the Working Group noted that the period is covered in two catalogues and was also assured that a single catalogue will be prepared at an early date.

e) Report by Correspondent for COSPAR Publications, B.G. Pressey

COSPAR Information Bulletin

Dr. B.G. Pressey reported that no specific resolution had been made by the Working Group in Florence on the subject of COSPAR Publications. However, a number of recommendations concerning the COSPAR Information Bulletin were made. An examination of the contents of the Bulletin since that time reveals the following relevant points:

- There have been four issues of the Bulletin, in July, September and November and February of which the September one was a special issue.

- The size of the Bulletin and the scope of the material in it have increased considerably.

- The activities of COSPAR and the space activities of other bodies have continued to be reported and on a greater scale.

- Short scientific articles on space experiments, either performed or planned, have been introduced.

- Articles of general scientific interest have been introduced and although they are not really of "letters to the Editor" type they could be included under the type of material envisaged in recommendation a(1) of Florence.

- No action is as yet evident in relation to the recommendation on the inclusion of bibliographies but it was recognized that this would not be possible in the immediate future.

- No action has yet been taken on the recommendations on format and publication aspects. Discussions with the Secretariat have taken place concerning the form of publication of the World List of Satellite Tracking Stations prepared by World Data Centre C.

The Working Group discussed the questions of (a) contents and general publication policy of the COSPAR Information Bulletin, (b) the size and frequency of publications and (c) the question of cost and distribution of the Bulletin.

The following recommendations were made:

i) Editorial Board

Working Group 3 recommends that an Editorial Board consisting of Dr. B.G. Pressey (Convener), Dr. G.I. Golyshev, Dr. H. Odishaw and Mr. P.J. Beaulieu (ex officio) be appointed to consider and advise on COSPAR publications, including means of improving the content and distribution of the COSPAR Information Bulletin and the appointment of national contacts for the Bulletin (see also Resolution 37, page 86).

ii) Frequency of Publication of COSPAR Information Bulletin

Considering that material is already becoming available in increasing quantities and that much of it is of immediate importance, Working Group 3 recommends that frequency of publication of the Bulletin should be increased and that starting in January 1963 there should be 6 issues per year, at regular intervals, each issue containing approximately 50 to 60 pages.

iii) Distribution of Information Bulletin

Working Group 3 makes the following recommendations concerning the distribution of the COSPAR Information Bulletin:

(a) Each COSPAR adhering country will be entitled to a certain amount of free copies, the exact number depending on the category of subscription. The following arrangement is suggested:

A. Satellite launching countries: up to 200 copies each;
B. Rocket launching countries: up to 150 copies each;
C. Other COSPAR adhering countries: up to 50 copies;
D. Space Committees of countries adhering to ICSU but not to COSPAR: up to 5 copies.

(b) In addition, free copies will be distributed, as recommended in the Florence meeting, to all members of the Executive Council and representatives of other international organizations active in COSPAR affairs and to members of the various COSPAR Working Groups.

(c) For others, the COSPAR Information Bulletin will be available on a nominal subscription rate. Concessional rates may be given to the COSPAR adhering countries giving bulk orders.

iv) Special Publication of WDC Guide and Unified Codes

Working Group 3 recommends that the Guide to Rocket and Satellite Information and Data Exchange, and the Booklet on Unified Codes be promulgated together in a special publication of the COSPAR Information Bulletin.

Review Journal of Space Science

Dr. de Jager, by invitation, reviewed for the Working Group the status of the undertaking by a commercial publisher of a review journal of space science of which he is editor assisted by an international editorial advisory group of about 20 scientists. The Working Group discussed this matter in relation to the plans for a very similar undertaking outlined at the Florence COSPAR meeting. It was not immediately clear whether the commercial project was too far advanced for COSPAR to become associated with it, but the Working Group recommended that the possibility be explored.

The following recommendation was made:

Working Group 3 recommends that COSPAR undertake discussions directed to its publication of a journal of space research reviews as proposed before and during the Florence meeting. In view of the proposed publication by a commercial organization, it is recommended that COSPAR and the editor attempt to achieve the transfer of the journal to COSPAR; if some relationship with the commercial organization is necessary to secure the transfer, proper contractual arrangements should be made by COSPAR to ensure its control of the publication and its policies. If a suitable transfer is not possible, COSPAR itself shall undertake the publication of a critical review journal as suggested at the Florence meeting.

f) Resolutions adopted by COSPAR
Upon recommendation of Working Group 3

RES. 31 Unified Synoptic Codes

COSPAR calls attention to the Booklet on Unified Synoptic Codes for rapid communication of Satellite Orbital Data issued March 1962 in response to Florence Resolution No. 28, and recommends the use of these codes by space science laboratories, tracking stations and computing centers, wherever appropriate. COSPAR requests the National SPACEWARN Contacts to take suitable initiative for their countries. The codes are recommended both for communication via SPACEWARN and by other channels. COSPAR acknowledges the contribution of the IWDS and of the many individuals and organizations in preparing the unified codes.

RES. 32 Radio Broadcasts of Satellite Information

COSPAR welcomes the cooperation of the authorities in Japan, France, USA and USSR in arranging for regular broadcasts of launching announcements and orbital predictions and thus aiding the international distribution of this information. COSPAR notes that many of the necessary details of these broadcasts have appeared in the COSPAR Information Bulletin. COSPAR calls on the National SPACEWARN Contacts for these countries, and any others which may later cooperate in this way, to make certain that the COSPAR Secretariat and the COSPAR Correspondent for SPACEWARN are promptly informed of all changes in schedule, content and radio frequencies of these transmissions so that this information may be widely distributed through the COSPAR Information Bulletin.

RES. 33 Cooperation with WMO Communication Network

COSPAR welcomes the recommendation of the WMO Commission on Synoptic Meteorology that Regional Associations or Members of WMO may wish to study the feasibility of disseminating COSPAR SPACEWARN messages of satellite orbital data within their Regions or within the countries concerned. COSPAR invites the Satellite Regional Warning Centers and the National SPACEWARN Contacts to initiate discussions with their counterparts in WMO so that every practical advantage may be taken of the possibility of cooperation with WMO in the distribution of launching announcements and orbital predictions to tracking stations and centers of space research for the benefit of all space science disciplines including meteorology.

RES. 34 Effectiveness of SPACEWARN System

COSPAR plans at its next meeting to review the effectiveness of communication arrangements, via SPACEWARN and otherwise, for distribution of launching announcements, orbital predictions and tracking observations, and therefore asks Satellite Regional Warning Centers and National SPACEWARN Contacts to provide the COSPAR Secretariat with such reports two months before the next COSPAR meeting.

RES. 35 Revised WDC Guide

COSPAR adopts the Revised Guide to Rocket and Satellite Information and Data Exchange prepared by Working Group 3 and calls upon the World Data Centers to observe its provisions with immediate effect.

COSPAR also calls the attention of the various international Unions and their associations, and in particular of the Comité International de Géophysique (CIG) and the Comittee for the International Quiet Sun Year (IQSY), to this document and requests their cooperation for implementing these data-interchange agreements. COSPAR also requests its adhering national committees to take the initiative in ensuring prompt flow of data from their countries to the World Data Centers in accordance with the provisions of this Guide.

RES. 36 Satellite Designation

COSPAR considers that the scheme for designating earth satellites by Greek letters has become cumbersome as the number of satellites launched into orbit each year grows large and therefore recommends that beginning with 1963 a new scheme be adopted in which each successful launching which results in an object which orbits for more than 90 minutes be designated by the year of launch and an ordinal serial number.

It is further recommended that the orbiting components or objects be designated by letters A, B, C.., where A refers to the component carrying the principal scientific payload; B, C, etc., as needed first for any subsidiary scientific payloads and then for inert components in order of maximum brightness during the early life of the satellites.

Thus a satellite component which under the old designation scheme would have been known as 1963 β2, would under the new scheme be known as 1963 2B (in case the number of components or objects of a satellite

RES. 36 (cont.) launching is large, the following convention will be used: the letters I and O will always be skipped; the 25th component or object will be designated AA, the 26th AB, etc., the 49th BA, etc., etc.).

The designations would be tentatively assigned in the launching announcement. A copy of this announcement is sent to the COSPAR Secretariat which would be responsible for making the final assignment according to the Universal Time of the launching, and for promulgating the information in the COSPAR Information Bulletin or, in case of an error, by appropriate telegraphic notice to the originator of the launching announcement who will then promptly advise SPACEWARN.

RES. 37 Contacts for COSPAR Information Bulletin

The Committee on Space Research (COSPAR),

considering that there has been a tendency for the material in the COSPAR Information Bulletin to be supplied from only a few sources and that it is highly desirable that the COSPAR Information Bulletin should contain space research information on a world-wide basis,

recommends that contacts for the COSPAR Information Bulletin should be appointed for each adhering country and for each Union with the responsibility of ensuring that the Secretariat is supplied with information on topics of interest within their country or organization.

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40. Working Group 4 on International Reference Atmosphere

a) Changes in Working Group 4

i) New Chairman

COSPAR accepted with regret the resignation of Mrs H.K. Kallmann-Bijl, Chairman of W.G. 4 (see "Votes of thanks", section 15, page 24-25), and appointed Dr. W. Priester Chairman of this Working Group.

ii) Sub-structure

On the recommendation of W.G. 4, COSPAR agreed to appoint a rapporteur and a deputy each for the three altitude regions of immediate interest to W.G. 4. These appointments are given in section (b) below (See also Resolution 39, page 89).

b) Revised membership

Chairman: Dr. W. Priester

a) Region from ~ 30 to ~ 100 km:
rapporteur: G.V. Groves (UK)
deputy : G.I. Golyshev (USSR) *

b) Region from ~ 100 to ~ 200 km:
rapporteur: K.S.W. Champion (USA)
deputy : S.M. Poloskov (USSR)

c) Region from ~ 200 km and above:
rapporteur: L.G. Jacchia (USA)
deputy : H.K. Paetzold (G.F.R.)

Members:
J. Blamont (France)
H. Friedman (USA)
R. Frith (UK)
H. Kallmann-Bijl (USA)
W.W. Kellogg (USA)
D.G. King-Hele (UK)
H.E. LaGow (USA)
J.E. Naugle (USA)
M. Nicolet (Belgium)
K.R. Ramanathan (India)
E.J. Vassy (France)
H. Wexler (USA)
T. Yonezawa (Japan)

*) Dr. Golyshev reserved the right to propose another member of his scientific staff to take his place if necessary.

c) Report of meeting of Working Group 4

Two meetings of Working Group 4 were held, on 30 April and 4 May. In attendance at one or both meetings were:

Members:

Mrs H. Kallmann-Bijl (USA), Chairman
J. Blamont (France)
K.S.W. Champion (USA)
G.V. Groves (UK)
K. Hirao (for T. Yonezawa, Japan)
L.G. Jacchia (USA)
W.W. Kellogg (USA)
D.G. King-Hele (UK)
H.E. LaGow (USA)
J.E. Naugle (USA)
M. Nicolet (Belgium)
H.K. Paetzold (German Fed. Rep.)
S.M. Poloskov (USSR)
W. Priester (German Fed. Rep.)
K.R. Ramanathan (India)
E.J. Vassy (France)
H. Wexler (USA)

Guests:

C.A. Barth (USA)
A. Court (USA)
I. Harris (USA)
H. Hinteregger (USA)
A. Lundbak (Denmark)
M. Roemer (German Fed. Rep.)

Mrs Kallmann-Bijl reported that the work of W.G. 4 was done primarily by correspondence. No official meeting of members of W.G. 4 has taken place since the COSPAR meeting in Florence.

She gave a brief summary of the work done by Working Group 4 which has been compiled in an informal report which was distributed to all the members of W.G. 4 and to the members of the COSPAR Executive Council. This report shows the activities of the Working Group during the last year. It contains comments, abstracts and papers from members and non-members of the group, which have been received in answer to a letter from the Chairman. In this letter the scientists were asked to contribute new results obtained in upper atmospheric physics from rocket and satellite research which are relevant to the purpose of W.G. 4, namely to study the necessity and possibility of improving the CIRA 1961 tables. The response to this request was very gratifying. The material received from distinguished scientists from many countries was so great that at times it was found difficult to handle all the contributions.

The new results are primarily observations and interpretation of the variation of atmospheric properties with latitude and season at an altitude up to about 100 km, the variation of density and related properties, with time and solar activity above about 200 km, and the variation of density with magnetic disturbances and magnetic storms.

Mrs Kallmann mentioned that in her opinion upper atmosphere tables, presenting physical reality as closely as possible, would be useful to the international community of scientists and

engineers actively engaged in rocket and satellite research.

The Working Group discussed the new results obtained which are relevant to the construction of the International Reference Atmosphere Tables. These results were arranged according to three altitude regions. It was proposed to elect correspondent members for these regions.(see Resolution 39, below).

The Working Group also dealt with the coordination of activities of Working Group 4 with other groups and organizations. This led to Resolution 40, page 90 , which was adopted by COSPAR.

As retiring Chairman, Mrs Kallmann expressed her gratitude and appreciation to the members and other contributors of W.G. 4. She mentioned that it was their work which permitted the presentation of the "COSPAR International Reference Atmosphere 1961" (CIRA) during the last COSPAR meeting in Florence, and the preparation of the Informal Report, presented at this meeting. She referred to the President of COSPAR, Professor van de Hulst, who gave constant advice and to Professor Kaplan with whom she frequently discussed scientific problems relevant to the studies of high altitude research. She acknowledged also the support of the Rand Corporation which made available for this work its electronic computing equipment and other technical facilities.

d) Resolutions adopted by COSPAR upon recommendation by Working Group 4

RES. 38 Continuation of the work of Working Group 4

COSPAR agreed that the scientists of Working Group 4 should continue their work with regard to the studies of upper atmosphere properties for the purpose of presenting the results of these studies in a coordinated and organized fashion and making these results available at the next COSPAR meeting. Working Group 4 will use this material in making recommendations as to whether and when new tables for an International Reference Atmosphere can and should be prepared.

RES. 39 Appointment of rapporteurs and deputies in W.G. 4

COSPAR agreed that there should be a rapporteur and a deputy each for the three altitude regions of immediate interest to Working Group 4, i.e.

a) Region from ~ 30 to ~ 100 km;
b) Region from ~100 to ~ 200 km;
c) Region from ~200 km and above.

The work of the rapporteurs will be to provide and coordinate results in their regions by collecting

RES. 39 (cont.) and making available the material relevant to the studies of Working Group 4, and to present reports to the Chairman and members of Working Group 4 before or at the next COSPAR meeting. The deputy will assist the rapporteur in his work and, if necessary, take his place at meetings or on other occasions.

The recommendations made by the rapporteurs and deputies do not preclude contributions from scientists who are not members of Working Group 4; in fact, these scientists, whose work is relevant, are encouraged to participate in the work of COSPAR Working Group 4.

RES. 40 Appointment of liaison members with IQSY and WMO

COSPAR agreed that, in order to make it possible for the members of Working Group 4 to improve the International Reference Atmosphere, there should be cooperation with other groups and organizations.

The following liaison members were appointed to coordinate activities of Working Group 4 with:

International Quiet Sun Year - Dr.J.E. Naugle
World Meteorological Organization - Dr.H. Wexler.

RES. 41 UNESCO financial support for work of W.G. 4

COSPAR agreed that the financial support to carry out the work of Working Group 4 shall be sought from UNESCO.

o o o o o

APPENDIX A

ICSU resolution 10 (1961)

Space Experiments with potentially undesirable effects

The General Assembly

considering that certain experiments conducted by means of space vehicles and contributing in an important way to the advancement of science, may also affect present or future scientific activities in other fields

invites the Committee on Space Research to examine any proposed experiments or other space activities that may have potentially undesirable effects on scientific activities and observations, to arrange for careful, objective, quantitative studies and to make available to Scientific and National Members, adhering to the International Council of Scientific Unions, and to Governments, the facts and analyses needed by them for making wise and proper decisions concerning the proposed experiments; and,

appeals to all Governments planning to launch space experiments which could possibly affect other scientific research adversely to make available to ICSU in timely fashion the information and data about the proposed experiments necessary to make the desired studies.

APPENDIX B

RESOLUTION ADOPTED BY THE GENERAL ASSEMBLY OF THE UNITED NATIONS ON 20 DECEMBER, 1961

1721 (XVI). International cooperation in the peaceful uses of outer space

A

The General Assembly,

Recognizing the common interest of mankind in furthering the peaceful uses of outer space and the urgent need to strengthen international cooperation in this important field,

Believing that the exploration and use of outer space should be only for the betterment of mankind and to the benefit of States irrespective of the stage of their economic or scientific development,

1. Commends to States for their guidance in the exploration and use of outer space the following principles:

   a) International law, including the Charter of the United Nations, applies to outer space and celestial bodies;

   b) outer space and celestial bodies are free for exploration and use by all States in conformity with international law and are not subject to national appropriation;

2. Invites the Committee on the Peaceful Uses of Outer Space to study and report on the legal problems which may arise from the exploration and use of outer space.

B

The General Assembly,

Believing that the United Nations should provide a focal point for international cooperation in the peaceful exploration and use of outer space;

1. Calls upon States launching objects into orbit or beyond to furnish information promptly to the Committee on the Peaceful Uses of Outer Space, through the Secretary-General, for the registration of launchings;

2. Requests the Secretary-General to maintain a public registry of the information furnished in accordance with paragraph 1 above;

3. Requests the Committee on the Peaceful Uses of Outer Space, in cooperation with the Secretary-General and making full use of the functions and resources of the Secretariat:

a) to maintain close contact with governmental and non-governmental organizations concerned with outer space matters;

b) to provide for the exchange of such information relating to outer space activities as Governments may supply on a voluntary basis, supplementing but not duplicating existing technical and scientific exchanges;

c) to assist in the study of measures for the promotion of international cooperation in outer space activities;

4. Further requests the Committee on the Peaceful Uses of Outer Space to report to the General Assembly on the arrangements undertaken for the performance of those functions and on such developments relating to the peaceful uses of outer space as it considers significant.

C

The General Assembly,

Noting with gratification the marked progress for meteorological science and technology opened up by the advances in outer space,

Convinced of the world-wide benefits to be derived from international cooperation in weather research and analysis,

1. Recommends to all Member States and to the World Meteorological Organization and other appropriate specialized agencies the early and comprehensive study, in the light of developments in outer space, of measures:

a) to advance the state of atmospheric science and technology so as to provide greater knowledge of basic physical forces affecting climate and the possibility of large-scale weather modification;

b) to develop existing weather forecasting capabilities and to help Member States make effective use of such capabilities through regional meteorological centres;

2. Requests the World Meteorological Organization, consulting as appropriate with the United Nations Educational, Scientific and Cultural Organization and other specialized agencies and governmental and non-governmental organizations, such as the International Council of Scientific Unions, to submit a report to its member Governments and to the Economic and Social Council at its thirty-fourth session regarding appropriate organizational and financial arrangements to achieve those ends, with a view to their further consideration by the General Assembly at its seventeenth session.

3. Requests the Committee on the Peaceful Uses of Outer Space, as it deems appropriate, to review that report and submit its comments and recommendations to the Eonomic and Social Council and to the General Assembly.

D

The General Assembly,

Believing that communication by means of satellites should be available to the nations of the world as soon as practicable on a global and non-discriminatory basis,

Convinced of the need to prepare the way for the establishment of effective operational satellite communication,

1. Notes with satisfaction that the International Telecommunication Union plans to call a special conference in 1963 to make allocations of radio frequency bands for outer space activities;

2. Recommends that the International Telecommunication Union consider at that conference those aspects of space communication in which international cooperation will be required;

3. Notes the potential importance of communication satellites for use by the United Nations and its principal organs and specialized agencies for both operational and informational requirements;

4. Invites the Special Fund and the Expanded Programme of Technical Assistance, in consultation with the International Telecommunication Union, to give sympathetic consideration to requests from Member States for technical and other assistance for the survey of their communication needs and for the development of their domestic communication facilities so that they may make effective use of space communication;

5. Requests the Internationa Telecommunication Union, consulting as appropriate with Member States, the United Nations Educational, Scientific and Cultural Organization and other specialized agencies and governmental and non-governmental organizations, such as the Committee on Space Research of the International Council of Scientific Unions, to submit a report on the implementation of those proposals to the Economic and Social Council at its thirty-fourth session and to the General Assembly at its seventeenth session;

6. Requests the Committee on the Peaceful Uses of Outer Space, as it deems appropriate, to review that report and submit its comments and recommendations to the Economic and Social Council and to the General Assembly.

E

The General Assembly,

Recalling its Resolution 1472 (XIV) of 12 December 1959,

Noting that the terms of office of the members of the Committee on the Peaceful Uses of Outer Space expire at the end of 1961,

Noting the report of the Committee on the Peaceful Uses of Outer Space,

1. Decides to continue the membership of the Committee on the Peaceful Uses of Outer Space as contained in Resolution 1472 (XIV) and to add Chad, Morocco, Mongolia and Sierra Leone to its membership in recognition of the increased membership of the United Nations since the Committee was established;

2. Requests the Committee to meet not later than 31 March 1962 to carry out its mandate as contained in Resolution 1472 (XIV) and to review the activities provided for in this resolution and to make such reports as it may consider appropriate.

APPENDIX C

Report to COSPAR Working Group 2 on the first IQSY Meeting Paris 26-29 March, 1962

By J. Bartels

An important decision was to change the beginning of the Years of the Quiet Sun: IQSY will start on January 1, 1964, and will end on December 31, 1965. This was the result of a long discussion, in which the unexpectedly fast decline of the present cycle had been demonstrated in sunspot numbers as well as in the geomagnetic planetary indices, Kp. The possibility that quiet intervals might occur even in 1963 was taken care of by the provision that Special World Intervals might be arranged by the declaration of Alerts by the International World Day Service, this plan to start on January 1, 1963.

The Paris Meeting of CIG/IQSY had been arranged so that the various working parties drew up the programmes for their disciplines, mainly in the form of resolutions. Those parts of the programmes referring to the domain of COSPAR were then discussed by a special group. They are herewith submitted to COSPAR Working Group 2, in the order of their disciplines:

Implication of Space Research to the Meteorological Programme of IQSY

The meteorological program for the IQSY being concerned primarily with the dynamics and thermodynamics of the high atmosphere above the 100 mb surface, the Working Group on Meteorology for IQSY identified certain aspects of the future international space research programmes relevant to meteorology. In addition to meteorological rockets, which will be an essential tool for extending the atmospheric observations of pressure, temperature and winds above the present level of balloons, the following satellite-borne experiments are of especial interest:

a) Worldwide observations from satellites of the total upward radiation from the earth and atmosphere have been shown to be correlated with cloud distributions and temperatures in the free atmosphere, and are essential in the study of the radiation balance in the high atmosphere.

b) Synoptic cloud cover and albedo observations from meteorological satellites, while essentially concerned with the troposphere, also have important implications to the radiation balance in the entire atmosphere.

c) Certain techniques are being developed for measuring the ozone distribution in the stratosphere by observations from a satellite of either the ultraviolet sunlight absorbed by the earth's limb at twilight or by measurements of the ultraviolet sunlight scattered by the atmosphere, either of which would be of value in studies of atmospheric ozone.

d) Observations from satellites of high level aerosols or clouds (eg. noctilucent clouds) would contribute to the meteorology of the high atmosphere.

e) Observations of changes in solar ultraviolet and X-ray fluxes, necessarily made from outside the earth's atmosphere, are essential to an understanding of solar-terrestrial relationships.

f) The changes in density above about 150 km accompanying magnetic storms, determined by observations of satellite drag, while somewhat above the region of primary interest in the meteorological program of IQSY, are of great interest in studies of solar terrestrial relationships, bring in fact one of the most direct indications so far obtained of actual heating in the upper atmosphere due to solar disturbances.

Geomagnetism

21. The Working Group notes with appreciation the valuable results so far obtained in geomagnetic space studies and the plans for future work.

22. The Working Group strongly supports the efforts being made to obtain component vectorial magnetic measurements at all levels. Such observations, besides being of great value for the World Magnetic Survey, could be utilized to study the time variations in all relevant frequency ranges; for instance, periods between about 0.5 and 40 seconds would be of special interest for the study of the continuous pulsations (pc) and pearl-type pulsations observed so frequently at many surface stations.

23. The Working Group would encourage the expansion of efforts to study by rockets the auroral and equatorial electrojets, and geomagnetic regional anomalies.

24. The Working Group would appreciate the provision of continuous telemetry of geomagnetic data from satellites to enable ground stations to participate in cooperative studies.

25. The Working Group endorses the resolutions 38 to 41 of COSPAR taken at Florence in April 1961 (published in CIG News No 5, p. 91) and adds to them as follows:

The Working Group notes with satisfaction that a number of space experiments have been proposed in National Reports to IQSY (CIG News No 5), such as:

a) USA (p. 80): Magnetometers to monitor the magnetic field and its fluctuations over a wide dynamic and frequency range to be flown at about 500 km altitude with a polar orbiting geophysical observatory (POGO).
Magnetometers to be carried in satellites on highly eccentric orbits (perigee about 100,000 km) and in space probes.

b) France (p. 72): Participation in an international study of the equatorial electrojet by sending magnometers in rockets in the region of Tchad. Similar study of the geomagnetic anomaly over Kerguelen.

c) UK and Australia: Rockets with proton magnetometers to be sent up from Woomera.

The Working Group hopes that geomagnetic studies with rockets and satellites as have been made by USA, USSR, UK and Australia, Canada, France, Japan, Italy will be continued in IQSY, and that other nations will join these studies, for instance, from the proposed rocket range at Kiruna.

Aurora

Rocket and satellite-borne experiments: The working group considers that it is of great importance that facilities should be arrangedso that there is suitable cooperation between ground based observers and satellite observations. COSPAR should be asked to ensure that this cooperation is effective.

The working group notes that the US NASA plans to launch a polar orbiting geophysical observatory in 1964. It is urged:
a - that this observatory be equipped with standardized photometers to measure auroral emissions in visible, ultraviolet and X-ray wavelengths.
b - that, in addition to data storage for command read-out, provision be made, as far as feasible, to transmit continuously the photometric data for reception by ground based auroral observing station.

The group further encourages:
a - the launching of additional photometry satellites to permit synoptic measurements in the northern and southern hemisphere;
b - the firing of rocket-borne experiments into auroras.

These experiments should be complementary to the satellite experiments and to those Ionospheric Rocket Sounding Experiments (described in CIG News 5 page 193).

Airglow

Rocket and satellite-borne experiments. A permanent study of the altitude of airglow emissions by rockets should be undertaken at different latitudes.

The Working Group draws attention particularly to the case of the red ray, which, because of the high altitude at which it is emitted, has not yet been studied using rockets.

Ionosphere

1) Synchronization of rocket experiments with artificial chemical clouds and ground based drift observations.

2) Coordination of top-side sounding experiments and vertical soundings on ground.

3) Synchronuous experiments with special ionospheric rockets and conventional ground based observations.

Solar Activity

Occultations of radio sources by the corona should continue to be recorded during IQSY and all possible methods of coronal observations should be undertaken from ground level as well as from balloons, rockets and satellites.

We regard as of fundamental importance the continuation of the various programmes for the measurement of the velocities, particle concentrations and of magnetic fields in interplanetary plasma of solar origin.

The IQSY period will also be opportune for the study of the sun's outer atmosphere by radar methods and we advocate daily recordings if possible.
Comparison of such observations with the scans of the white corona to be made from satellites and from ground level would be of special value.

Resolutions:

1. We regard the proposed experiments to be undertaken from the satellites S-17 of the NASA Program as of great importance and we recommend the continuity of such recordings during the IQSY period. These are spectro-heliographic observations in X-ray and U-V wave-lengths as well as detailed mapping of the white light corona out to distances of 10 solar radii.

2. Since it is now possible to measure in absolute units (from rockets and satellites) the flux in important wave-length bands (X-rays and far ultra-violet) we recommend that special attention be given to this type of measurement during IQSY when solar conditions will be basic. Absolute measures of radio flux on a day-to-day basis would also be valuable.

3. We emphasise the importance of continuous studies of the white light corona from ground level stations as well as from balloons, rockets and satellites. These observations should extend outwards from the limb to distances as great as possible.

4. We recommend that all necessary items be taken to strengthen and improve the longitude coverage of the solarpatrol. We advocate the installation of a patrol heliograph at the Manila Solar observatory in time for IQSY and we express the hope that adequate funds will be forthcoming for its establishment. In addition, a patrol station should be

established in South America at a place combining the best climatic conditions with a westerly longitude.

The Special Group of IQSY added the following recommendation:
It is desirable to study the possibility of determining the solar constant by space experiments during IQSY.

Cosmic Rays

In view of the importance of carrying out continuous monitoring of the primary cosmic rays during IQSY it is strongly urged that relatively simple and standardized energetic particle detectors be carried in as many satellites as possible in orbits below the radiation belt. Such a program should provide simultaneous observations above a number of different points on the earth's surface.

In view of the enormous advantages which would accrue from the accurate identification of two or three pairs of magnetically conjugate points, it is urged that COSPAR should examine the possibilities of instigating a program for the identification of such points by the artificial injection of charged particles.

Some samples of the kind of experiments which could be carried out are:

- Study of dumping of trapped particles
- Effects of solar activity on the outer parts of the geomagnetic field
- Geometry of this field distorted by solar plasma
- Study of propagation of magnetic hydrodynamic waves through the magnetosphere
- Simultaneous Aurora, Airglow and micropulsation observations
- Simultaneous ionospheric measurements

Aeronomy

In the light of the observational programmes proposed by the various IQSY disciplines, the following observations should be considered together as the minimum requirements to obtain a coherent picture of aeronomic processes during the solar minimum activity.

1. Considering that for aeronomy studies, it is necessary to know:

(1) absolute values of solar energies in the far ultraviolet and X-ray spectrum to determine the effect of solar heating in the thermosphere.

(2) the spectral distribution of solar radiation to obtain the number of photons available for all physical processes.

(3) The atmospheric absorption of solar radiations for various spectral ranges to determine the active interactions throughout the atmosphere.

(4) The specific absorptions by various constituents; to determine the ionization and dissociation processes.

(5) The significance of the various solar indices in relation to the magnetic indices.

It is recommended that:

(1) solar ultraviolet spectra be obtained by rockets through the thermosphere up to the zeroth optical depths to determine the nature of the interaction of solar radiations with the thermosphere at all heights; it is important to conduct rapid spectrographic scans with rocket borne instrumentation throughout the absorbing region with the highest possible resolution.

(2) a) absolute intensities of lines be measured in the whole ultraviolet spectrum to obtain energy distribution of a quiet sun for comparison with that during disturbed conditions.

b) the principal lines of the solar ultraviolet spectrum be monitored from satellites to insure an accurate knowledge of the variations with solar activity.

c) various X-ray spectral ranges be monitored from satellites in comparison with specific ultraviolet radiations.

To determine the solar spectrum above the absorbing atmosphere, absolute photometry must be conducted continuously from monitoring satellites. This may take the form of complete spectrum scans or photometry of specific wavelengths or wavelength band.

2. Considering that the lower thermosphere determines the boundary conditions for the thermosphere and exosphere, detailed observations by small rockets used in the mesosphere and reaching the lower thermosphere, it is recommended that pressure and density be measured with great precision.

To accomplish the required measurements, it is desirable to have a single stage solid propellant rocket capable of carrying a 15 kg payload to about 150 km. It is urged that an effort be made to develop an inexpensive and reliable rocket with this capability.

3. Considering that the dissociation of molecular oxygen in the lower thermosphere in relation with the total density must be known at various latitudes and seasons, it is recommended that measurements by rockets be made using optical means (X-ray, ultraviolet filters) to obtain vertical distribution up to 200-250 km.

To accomplish direct measurements of the concentration of O_2 it is desirable to develop standardized photometers for solar ultraviolet radiation at wavelengths of about 1450 A and Lyman-alpha.

To accomplish direct measurements of total density it is desirable to develop standardized X-ray photometers for the wavelength intervals 8-20 A and 44-60 A.

4. Considering that the knowledge of the various kinds of positive ions is of fundamental importance for the determination of reactions between ions and electrons, it is recommended that measurements by rockets be made in the whole ionosphere to be compared with the vertical distribution of electronic concentration obtained from ionograms, and if possible from simultaneous rocket measurements.

To accomplish measurements of the neutral and ion composition below the thermosphere, it is desirable to:

a) develop rocket borne mass spectrometers for operation at relatively high ambient pressures.

b) improve the sensitivity of mass spectrometry for minor constituents

c) develop a satisfactory measurement of atomic oxygen.

To accomplish measurements of composition above the thermopause, it is desirable to develop rocket borne mass spectrometers capable of resolving constituents in the range of transition from oxygen-nitrogen to helium-hydrogen down to concentrations of the order of 100 per cc.

5. Considering that the vertical distribution of the airglow radiations must be known with enough precision to determine the atomic and molecular reactions, it is recommended that rocket observations be made both day and night from equatorial to high latitudes to study the variation of the vertical distributions.

To accomplish the resolution of the altitude distributions of airglow emissions, it is desirable to develop appropriate photometers and spectroscopic means of isolating the various radiations and to conduct rocket measurements up to the maximum heights at which the emissions occur.

6. Considering that rapid surveys of airglow phenomena such as arcs of red and green lines of oxygen related to the ionospheric F region are necessary, it is recommended that satellites be instrumental to map the movements of the oxygen red and green line emissions.

7. Considering that the same parameters can be determined by means of rockets or satellites at and above 200 km , it is recommended that attempts be made to obtain rocket measurements of density coincident in altitude and time with satellite drag measurements.

8. Considering that seasonal or geographical variation of the thermosphere may be detected during very quiet solar conditions, it is recommended that precise satellite observations be made for a detailed analysis of the atmospheric vertical distribution of density.

9. Considering that atomic hydrogen is an important tracer of diffusion conditions in the thermosphere and of escape conditions from the exosphere, it is recommended that

a) continuous photometry of the Lyman-alpha glow be conducted from satellites to establish the variation in overhead hydrogen with solar activity.

b) rocket measurements of the solar Lyman-alpha profile be conducted at altitudes from 90 km to 200 km to determine the variation in scale height of atomic hydrogen in the thermosphere.

10. Considering that direct measurements of the temperature in the thermosphere are of considerable importance, it is recommended that methods such as Doppler effect in chemical clouds and the velocity distribution of neutral particles by mass spectrometer techniques be used.

11. Considering that a knowledge of turbulent conditions in the lower thermosphere is necessary, it is recommended that chemical seeding from rockets be used to trace the movements of the atmosphere.

12. Considering that infra-red emmission from the thermosphere is an important source of energy dissipation, it is recommended that rocket experiments be conducted to measure the flux of the 63 micron oxygen emmission.

(The full text of the IQSY programmes will be published in one of the CIG News, also in the IUGG News Letter, both edited by G. Laclavère, 140, Rue de Grenelle, Paris 7e, France.)

APPENDIX D

Report on Activities of SPACEWARN Network in 1961 by the COSPAR Correspondent for SPACEWARN

A.H. Shapley

The international system for rapid communication of orbital information concerning scientific satellites now called the SPACEWARN system. has been in active existence during and since the IGY. This has provided a channel for the wide distribution of information of general interest. The guide-lines for the SPACEWARN system have been given by COSPAR in resolutions at the Nice and Florence meetings.

The information handled on the SPACEWARN network falls in the following categories:

(1) Launching announcements of satellites and space probes, introduced by launching authorities

(2) Orbital elements for prediction purposes (Code SATOR), introduced by computer, centers

(3) Ephemerides for individual stations, where appropriate (Code SATAT) introduced by computing centers

(4) Reports of Observations, where appropriate (Code SATEV) introduced by tracking stations or tracking network headquarters

For the international interchange of launching announcements and orbital elements, Satellite Regional Warning Centers (SRWC) are designated, located at institutions near Washington, Moscow, Tokyo and in Western Europe. Messages are introduced into the system at the SRWC most convenient to the launching authority or computing center originating the information. This SRWC (the SRWC of origin) sends the message by telegram to each of the other three SRWC. All SRWC then proceed to give the message appropriate distribution to stations and centers within their region according to regional plans.

For the international forwarding of ephemerides for individual stations and of reports of observations, the SRWC and the SPACEWARN system may be used, but ordinarily such information should go directly between the tracking station and the computing center.

Arrangements for setting up communication links between the SRWCs and individual centers or stations are the responsibility of the National SPACEWARN contacts, individuals designated for each country participating in COSPAR who work in conjunction with the SRWC involved.

The communication links between SRWCs are by telegram or teletype. The links from an SRWC to individual centers or tracking stations for launching announcements and orbital elements are by telegram, teletype airmail or regional radio broadcast. The links between an SRWC and individual centers of tracking stations for ephermeris and reports of observation, when the SPACEWARN system is used, are usually by telegram, teletype or airmail.

The format of SPACEWARN messages and the recommended codes are specified in the COSPAR booklet of Unified Synoptic Codes (March 1962). Launching announcements are given in plain language. Orbital elements are expressed in Code SATOR. Ephemerides for individual stations are in Code SATAT. Reports of observations should be in Code SATEV. All SPACEWARN messages are identified by the word SPACEWARN followed by a 5-digit group indicating the SRWC of origin, the type of message and a serial number.

The work of the SPACEWARN system is coordinated by the COSPAR Correspondent for SPACEWARN who is the spokesman to COSPAR of the ICSU International World Day Service. This coordination is accomplished by circular letters to SRWCs and to National SPACEWARN Contacts and by material published in the COSPAR Information Bulletin.

II Launching Announcements

In 1961, there were 12 launching announcements processed over the SPACEWARN network. SRWC AGIWARN was the SRWC of origin for 11 and SRWC COSMOS was the SRWC of origin for the other. (In the period January - April 1962, there were 10 launching announcements, 6 from SRWC AGIWARN and 4 from SRWC COSMOS.)

III Orbital Elements for Prediction Purposes

In 1961, there were 156 SATOR messages distributed over SPACEWARN, referring to 27 different satellites. For each satellite, the orbital predictions were revised and reissued at appropriate intervals ranging from a few days to about two weeks depending on the altitude of the satellite. SRWC AGIWARN was the SRWC of origin for all of these predictions. During 1961 there were no prediction messages distributed over SPACEWARN network from other launching authorities.

IV Ephemerides for Individual Stations

The reports received from SRWC do not mention messages of ephemerides for individual stations. COSPAR resolutions encourage the use of orbital elements for prediction purposes (Code SATOR) instead of individual ephemcrides. COSPAR resolutions also encourage direct communication links between computing centers and tracking stations in case individual ephemerides are used and it is understood there is heavy traffic of this kind referring to satellites launched by USSR.

V Reports of Observations

During 1961, 246 messages containing 589 sets of tracking observations of 33 satellites flowed over the SPACEWARN system to SRWC AGIWARN for U.S. computing centers. SRWC Darmstadt sent 253; SRWC Tokyo sent 73; SRWC COSMOS sent 263 through September 1961 after which time the reports were sent by airmail to SRWC AGIWARN. In addition a total of 10 messages with 42 sets of tracking observations for 9 satellites were received by airmail at SRWC AGIWARN for U.S. computing centers. No information is available regarding the use of the SPACEWARN system for forwarding tracking observations to other computing centers.

VI Regional SPACEWARN Activity in Western Hemisphere

SRWC AGIWARN has distributed launching announcements and orbital elements to interested groups in the Western Hemisphere. Telegrams were sent to 11 addresses in 11 countries. (As of March 8, 1962, most telegrams to South America were discontinued in favor of the regular radio broadcasts, so telegrams are now sent to 2 addresses in 2 countries, Canada and Brazil.) In addition these telegrams are sent to two addresses in Australia and 8 addresses in U.S.A. This same information is sent by airmail to 21 addresses in U.S.A. and the Western Hemisphere and one in New Zealand.

Regional broadcast of launching announcements and orbital elements to South America is made daily (except Monday) at about 0330 UT over Voice of America transmitters. For details, see COSPAR Information Bulletin 7.

No tracking observations from tracking stations or network headquarters in the Western Hemisphere flowed through SRWC AGIWARN. The COSPAR resolutions indicate a preference for direct links between tracking stations and computing centers for this purpose.

VII Regional SPACEWARN Activity in Western Europe

SRWC Darmstadt (as of October 1961) distributed launching announcements to 19 addresses in 8 countries; the methods of communication were by Telex (9), telegram (3), mail (7). Orbital elements (SATOR) were distributed to 7 addresses in 7 countries, by Telex (3), by telegraph (1) and by mail (3).

SRWC Darmstadt (as of October 1961) also distributes launching announcements and first orbital elements as received from SPACECONN NASA GREENBELT to a number of these same addresses.

SRWC Slough makes local use of information distributed over the SPACEWARN system.

The World Days Communications (URSIgram) center at Bagneux (Paris) broadcasts launching announcements and orbital elements at regular times of day. For details, see COSPAR Information Bulletin No.7 .

Tracking observations are collected through SRWC Darmstadt as follows: (1) optical (visual), from two tracking network headquarters and forwarded to SRWC AGIWARN; (2) radio (doppler) from stations and forwarded by mail and Telex to WDC-A (Washington) WDC-C (Slough) or SRWC AGIWARN; (3) radio (field strength), from one analyzing center and forwarded by mail to WDC-A and WDC-C.

VIII Regional SPACEWARN Activity in Western Pacific.

SRWC Tokyo (as of October 1961) reported that it is serving 21 stations in 3 countries (including Japan) and also 4 institutions in 3 countries (including Japan).

Regional broadcasts of launching announcements and orbital elements are made regularly by the URSIgram service. For details, see COSPAR Information Bulletin No.7.

IX Regional SPACEWARN Activity in Eurasia

Ephemerides of USSR-launched artificial satellites are regularly communicated to the countries in the Eurasian region, including USSR, Czechoslovakia, Poland, Peoples Republic of China, Mongolia, Bulgaria, Roumania. The sending of the same type of information on US-launched satellites has already been started. The SRWC in Moscow has started distributing SPACEWARN telegrams received from other SRWCs.

X National SPACEWARN Contacts and SRWCs

The COSPAR booklet of Unified Synoptic Codes (March 1962) contains the names and addresses of the 15 National SPACEWARN Contacts who have been designated by the countries participating in COSPAR. The names of the Contacts for the remaining 3 countries will be added in the reprinting of the list in an early issue of the COSPAR Information Bulletin. Also listed are two Contacts from non-participating countries. The booklet also gives the necessary information on the Satellite Regional Warning Centers.

May 8, 1962